DOCUMENT RESUME

ED 258 050 CE 041 795

TITLE	Preventive Maintenance and Operating Techniques for Heavy Vehicles.
INSTITUTION	Marine Corps Inst., Washington, DC.
REPORT NO	MCI-35.24
PUB DATE	28 Jun 83
NOTE	102p.; For related documents, see CE 041 790-796.
PUB TYPE	Guides - Classroom Use - Materials (For Learner) (051)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Adult Education; *Auto Mechanics; Behavioral Objectives; Continuing Education; *Correspondence Study; Course Content; Engines; Independent Study; Learning Activities; *Mechanics (Process); Military Training; *Motor Vehicles; *Prevention; Programed Instructional Materials; Study Guides
IDENTIFIERS	Heavy Equipment Operators

ABSTRACT

This correspondence course, originally developed for the Marine Corps, is designed to provide students who are acquainted with motor transport and tactical heavy vehicles with information on how to operate and perform preventive maintenance of those vehicles. The course contains five study units covering 2.5-ton M-Series tactical trucks, 5-ton and 10-ton M-Series tactical trucks, operating instructions for heavy tactical vehicles, preventive maintenance services, and M-Series tactical trailers. Each study unit begins with a general objective, which is a statement of what the student should learn from the study unit. The study units are divided into numbered work units, each presenting one or more specific objectives, and illustrated unit texts. At the end of the unit texts are study questions with answers. A review lesson completes the course. (KC)

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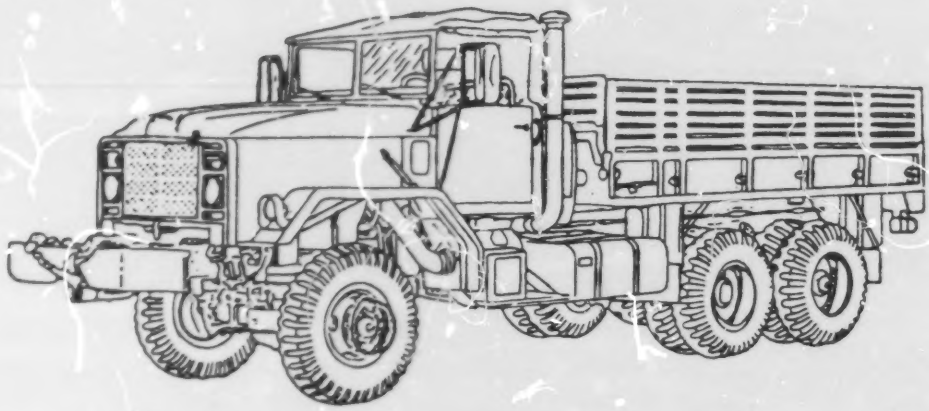
PREVENTIVE MAINTENANCE



AND OPERATING TECHNIQUES

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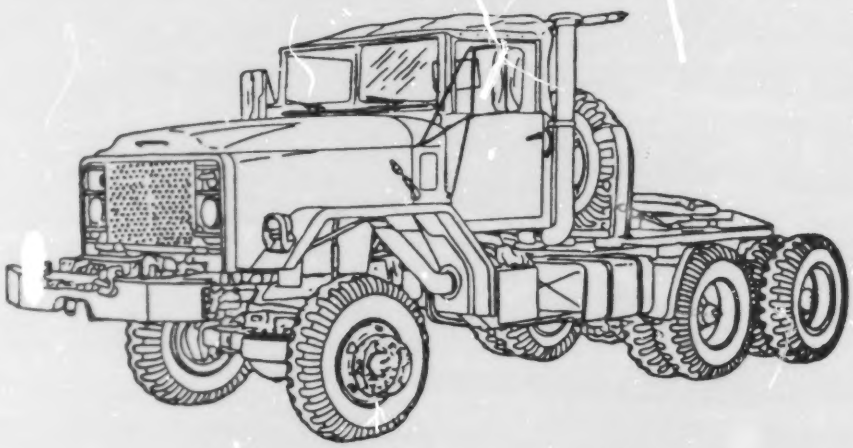

FOR HEAVY VEHICLES

MARINE CORPS INSTITUTE
MARINE BARRACKS
WASHINGTON, D.C.

ED041755

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35.24
28 June 1983

1. ORIGIN

MCI Course 35.24, Preventive Maintenance and Operating Techniques for Heavy Vehicles, has been prepared by the Marine Corps Institute.

2. APPLICABILITY

This course is for instructional purposes only.

J. M. D. HOLLADAY
Lieutenant Colonel, U.S. Marine Corps
Deputy Director

ACKNOWLEDGMENT

The Marine Corps Institute, Marine Barracks, Washington, D.C. gratefully acknowledges the important contributions provided by the following MCI personnel in developing and publishing this course:

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PREVENTIVE MAINTENANCE AND OPERATING TECHNIQUES FOR HEAVY VEHICLES

Course Introduction

PREVENTIVE MAINTENANCE AND OPERATING TECHNIQUES FOR HEAVY VEHICLES is designed for privates through sergeants in the 3500 MOS. The Marine will be acquainted with motor transport, tactical heavy vehicles. The Marine will be provided with information on how to operate and perform preventive maintenance of heavy vehicles.

ADMINISTRATIVE INFORMATION

ORDERS OF STUDIES

Study Unit Number	Study Hours	Subject Matter
1	4	2 1/2-ton M-Series tactical truck
2	4	5-ton and 10-ton M-Series tactical trucks
3	3	Operating instructions of heavy tactical vehicles
4	4	Preventive-maintenance services
5	2	M-Series tactical TRL
	2	REVIEW LESSON
	2	FINAL EXAMINATION
	21	

RESERVE RETIREMENT CREDITS: 7

EXAMINATION: Supervised final examination without text or notes; time limit 2 hours.

MATERIALS: MCI 35.24 Preventive Maintenance and Operating Techniques For Heavy Vehicles. Review lesson and answer sheet.

RETURN OF MATERIALS: Students who successfully complete this course are permitted to keep the course materials.

Students disenrolled for inactivity or at the request of their commanding officer will return all course materials.

Source Materials

TM-9-2320-209-10	Operator's manual for 2 1/2-ton 6x6
TM-9-2320-211-10	Operator's manual for 5-ton 6x6 M39 Series
TM-9-2320-206-10	Operator's manual for 10-ton 6x6
TM-9-2320-260-10	Operator's manual for 5-ton 6x6 M809 Series
TM-9-2320-272-34-2	Maintenance manual for 5-ton 6x6 M939 Series
TM-9-2330-211-14	Operator's manual for 15-ton low bed TRL M-172A1
TM-9-2330-208-15	Operator's manual for semi-TRL tank gas 12-ton 4 WHL M131A2
TM-9-2330-203-14	Operator's manual for Dolly TRL converter 6-ton 2 WHL M-197A1 and 8-ton 2 WHL M-158A1
TM-9-2330-213-14	Operator's manual for chassis TRL 1 1/2 ton cargo 2 WHL M105A2C
TM-9-2330-217-14	Operator's manual for trailer tank water 400 gallon 1 1/2-ton 2 WHL M149A1

HOW TO TAKE THIS COURSE

This course contains 5 study units. Each study unit begins with a general objective which is a statement of what you should learn from that study unit. The study units are divided into numbered work units, each presenting one or more specific objectives. Read the objective(s) and then the work unit text. At the end of the work unit text are study questions which you should be able to answer without referring to the text of the work unit. After answering the questions, check your answers against the correct ones listed at the end of the study unit. If you miss any of the questions, you should restudy the text of the work unit until you understand the correct response. When you have mastered one study unit, move on to the next. After you have completed all study units, complete the review lesson and take it to your training officer or NCO for mailing to MCI. MCI will mail the final examination to your training officer or NCO when you pass the review lesson.

TABLE OF CONTENTS

	Work Unit	Page
Course introduction		i
Source materials		i
Table of contents		iii
Study guide		v
Study Unit 1. 2 1/2-TON M-SERIES TACTICAL TRUCK		
Section I. 2 1/2-ton M-Series truck		
Characteristics	1-1	1-1
Section II. Truck systems		
Power plant system	1-2	1-5
Power train system	1-3	1-9
Chassis support systems	1-4	1-12
Section III. Model variation 2 1/2-ton		
2 1/2-ton Model Characteristics	1-5	1-12
Summary Review		1-13
Study Unit 2. 5-TON AND 10-TON M-SERIES TACTICAL TRUCKS		
Section I. 5-Ton M-Series tactical truck		
Characteristics	2-1	2-1
M-39 series (multifuel)	2-2	2-1
M809 series (cummins)	2-3	2-5
M939 series (cummins)	2-4	2-8
M39 series (retrofit)	2-5	2-18
Section II. 10-Ton M-Series tactical trucks		
Characteristics	2-6	2-18
Truck systems	2-7	2-20
Summary Review		2-21
Study Unit 3. OPERATING INSTRUCTIONS OF HEAVY TACTICAL TRUCKS		
Break-in operation	3-1	3-1
Controls and instruments	3-2	3-2
Summary Review		3-8
Study Unit 4. PREVENT-MAINTENANCE SERVICES		
Preventive maintenance	4-1	4-1
Preventive maintenance forms	4-2	4-1
Corrective maintenance	4-3	4-8
Maintenance under unusual conditions	4-4	4-25
Maintenance of material after fording	4-5	4-26
Maintenance after operation on unusual terrain	4-6	4-27
Summary Review		4-27
Study Unit 5. M-SERIES TACTICAL TRAILERS		
M105 trailer	5-1	5-1
M149 water trailer	5-2	5-2
M127A1 semi-trailer	5-3	5-3
M172A1 Low-bed trailer	5-4	5-4
M-Series Dolly converter's	5-5	5-4
Summary Review		5-7

MARINE CORPS INSTITUTE

STUDY GUIDE

Welcome to the Marine Corps Institute correspondence training program. By enrolling in this course, you have shown a desire to improve the skills you need for effective job performance, and MCI has provided materials to help you achieve your goal. Now all you need is to develop your own method for using these materials to best advantage.

The following guidelines present a four-part approach to completing your MCI course successfully:

1. Make a "reconnaissance" of your materials;
2. Plan your study time and choose a good study environment;
3. Study thoroughly and systematically;
4. Prepare for the final exam.

I. MAKE A "RECONNAISSANCE" OF YOUR MATERIALS

Begin with a look at the course introduction page. Read the COURSE INTRODUCTION to get the "big picture" of the course. Then read the MATERIALS section near the bottom of the page to find out which text(s) and study aids you should have received with the course. If any of the listed materials are missing, see Information for MCI Students to find out how to get them. If you have everything that is listed, you are ready to "reconnoiter" your MCI course.

Read through the table(s) of contents of your text(s). Note the various subjects covered in the course and the order in which they are taught. Leaf through the text(s) and look at the illustrations. Read a few work unit questions to get an idea of the types that are asked. If MCI provides other study aids, such as a slide rule or a plotting board, familiarize yourself with them. Now, get down to specifics!

II. PLAN YOUR STUDY TIME AND CHOOSE A GOOD STUDY ENVIRONMENT

From looking over the course materials, you should have some idea of how much study you will need to complete this course. But "some idea" is not enough. You need to work up a personal study plan; the following steps should give you some help.

(A) Get a calendar and mark those days of the week when you have time free for study. Two study periods per week, each lasting 1 to 3 hours, are suggested for completing the minimum two study units required each month by MCI. Of course, work and other schedules are not the same for everyone. The important thing is that you schedule a regular time for study on the same days of each week.

(B) Read the course introduction page again. The section marked ORDER OF STUDIES tells you the number of study units in the course and the approximate number of study hours you will need to complete each study unit. Plug these study hours into your schedule. For example, if you set aside two 2-hour study periods each week and the ORDER OF STUDIES estimates 2 study hours for your first study unit, you could easily schedule and complete the first study unit in one study period. On your calendar you would mark "Study Unit 1" on the

appropriate day. Suppose that the second study unit of your course requires 3 study hours. In that case, you would divide the study unit in half and work on each half during a separate study period. You would mark your calendar accordingly. Indicate on your calendar exactly when you plan to work on each study unit for the entire course. Do not forget to schedule one or two study periods to prepare for the final exam.

(C) Stick to your schedule.

Besides planning your study time, you should also choose a study environment that is right for you. Most people need a quiet place for study, like a library or a reading lounge; other people study better where there is background music; still others prefer to study out-of-doors. You must choose your study environment carefully so that it fits your individual needs.

III. STUDY THOROUGHLY AND SYSTEMATICALLY

Armed with a workable schedule and situated in a good study environment you are now ready to attack your course study unit by study unit. To begin, turn to the first page of study unit 1. On this page you will find the study unit objective, a statement of what you should be able to do after completing the study unit.

DO NOT begin by reading the work unit questions and flipping through the text for answers. If you do so, you will prepare to fail, not pass, the final exam. Instead, proceed as follows:

(A) Read the objective for the first work unit and then read the work unit text carefully. Make notes on the ideas you feel are important.

(B) Without referring to the text, answer the questions at the end of the work unit.

(C) Check your answers against the correct ones listed at the end of the study unit.

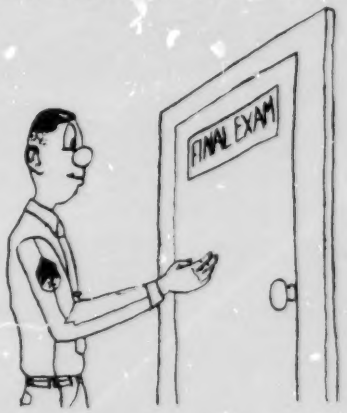
(D) If you miss any of the questions, restudy the work unit until you understand the correct response.

(E) Go on to the next work unit and repeat steps (A) through (D) until you have completed all the work units in the study unit.

Follow the same procedure for each study unit of the course. If you have problems with the text or work unit questions that you cannot solve on your own, ask your section OIC or NCOIC for help. If he cannot aid you, request assistance from MCI on the Student Course Content Assistance Request included with this course.

When you have finished all the study units, complete the course review lesson. Try to answer each question without the aid of reference materials. However, if you do not know an answer, look it up. When you have finished the lesson, take it to your training officer or NCO for mailing to MCI. MCI will grade it and send you a feedback sheet listing course references for any questions that you miss.

IV. PREPARE FOR THE FINAL EXAM



How do you prepare for the final exam? Follow these four steps:

(A) Review each study unit objective as a summary of what was taught in the course.

(B) Reread all portions of the text that you found particularly difficult.

(C) Review all the work unit questions, paying special attention to those you missed the first time around.

(D) Study the course review lesson, paying particular attention to the questions you missed.

If you follow these simple steps, you should do well on the final. GOOD LUCK!

STUDY UNIT 1

2 1/2-TON M-SERIES TACTICAL TRUCK

STUDY UNIT OBJECTIVE: UPON SUCCESSFUL COMPLETION OF THIS STUDY UNIT, YOU WILL IDENTIFY THE CHARACTERISTICS, TRUCK SYSTEMS, AND MODEL VARIATIONS OF THE 2 1/2 TON 6x6 M-SERIES TACTICAL TRUCK.

Every Marine, whether a scout on a Fire Team, a company clerk, or even the Commandant, may at times require some type of motor transport support. Vehicles may be used to bring the mail or for hauling ammunition to a company of Marines in combat. In all situations the motor transport operator must know his vehicle; how it will perform; its capabilities; and how far the vehicle will travel on a tank of fuel. He must also know the places where it should not go.

Section I. 2 1/2 TON M-SERIES TACTICAL TRUCK CHARACTERISTICS

Work Unit 1-1. CHARACTERISTICS

LIST THE FOUR GENERAL CHARACTERISTICS OF M-SERIES TACTICAL TRUCKS.

NAME THE FOUR BASIC WHEELBASE CHASSIS.

The following four general characteristics of the 2 1/2 ton M-series trucks are:

Designed for all types of terrain
Fording capabilities
All-wheel drive capabilities
Provides ten speed ranges

The 2 1/2-Ton 6x6 M-series trucks are designed as tactical vehicles for use over all types of roads, highways and cross-country terrain. These vehicles will ford hard-bottom water crossings to a depth of 30 inches without the aid of special fording equipment. Vehicle power is supplied by a six-cylinder, in-line, liquid-cooled multifuel, compression ignition engine. Engines are conventionally located at the front of the truck. A 5-speed transmission and 2-speed transfer provides ten speed ranges. Normal drive is the 6-wheel rear bogie. Traction conditions which allow slippage of the rear wheels, set up automatic engagement of the front wheels. On newer models, engagement of front wheel drive is done by the operator with a selector switch located under the instrument cluster.

Transmission and transfer are controlled by manually shifting levers in the cab. Service brakes are air-actuated, hydraulic internal expanding type. Cabs are equipped with fabric tops and are ventable, and have lowerable windshields. A towing pintle hook is provided on the frame rear cross members. Lifting points, two front shackles and a pin, are located atop each left and right rear spring between the sets of rear wheels and provide ready means of lifting the truck for transportation. A spreader bar should be used with the rear lifting shackles to prevent body damage. Tie-down shackles located on each side of the body together with the front lifting shackles provide ready attaching points for tie-down cables.

Four basic wheelbase chassis (cargo, fuel tanker, water tanker, van) provide for mounting the various body types.

The cargo body is designed for use as a general purpose cargo and troop carrier. Folding seats accommodate the troops and a canvas cover supported by bows serves to protect cargo and/or troops from inclement weather.

M35A1 and M35A2 (figs 1-1 and 1-2) powered by an in-line 6 cylinder continental engine (multifuel) with 140 brake horsepower at 2600 rpm. Fuel capacity is one 50-gallon tank. Oil and filter refill capacity equals 20 quarts. Tires are 10-ply rated 9.00x20, payload highway 10,000 pounds. Normal payload is also 10,000 pounds.

Fig 1-1. 2-1/2 ton, 6x6, cargo truck M35A1 - left front view cab top, front and side rails installed.

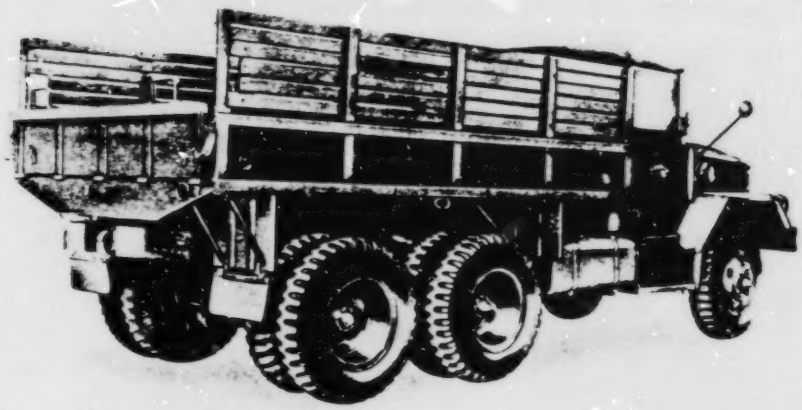
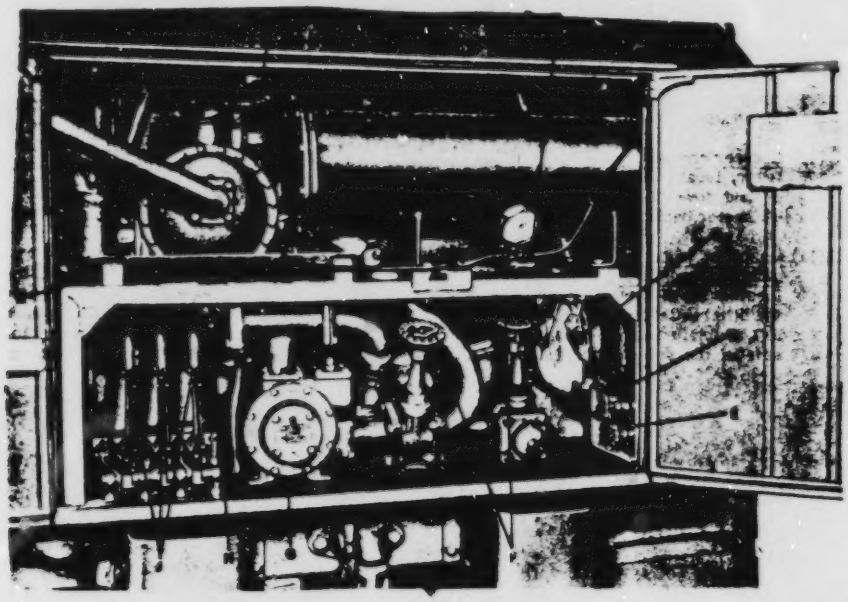


Fig 1-2. 2-1/2 ton, 6x6, cargo truck, M35A1 - right rear view with cab top, front and side rails installed.

The fuel tanker (fig 1-3) is designed to carry from one to two different types of fuel in its two tanks, a pump and hose provide means of transferring from tanker to using equipment. The M49A2C fuel tanker is powered by an in-line 6 cylinder continental engine (multifuel) with 140 brake horsepower at 2600 rpm. Fuel capacity is 50 gallons in one fuel tank. Tires are 10 ply rated 9.00x20. Payload is 1200 gallons.

Fig 1-3. 2-1/2 ton 6x6 fuel servicing tank truck M49C - left front view.



Key	Item	Key	Item
A	Counter control lever	F	Gate valve handles
B	Pressure gage shutoff valve handle	G	Delivery pump draincock
C	Grounding wire	H	Meter drain knob
D	Dump valve knob	J	Operating levers
E	Drain valve knob	K	Liquid level gage

Fig 1-4. Fuel tank truck - rear compartment.

The water tanker (fig 1-5 and 1-6) is designed to supply water for various purposes. A by-pass valve in the engine exhaust system diverts the exhaust gases to heat the water to prevent freezing.

The M50A1 water tanker is powered by an in-line 6 cylinder continental engine (multifuel) with 140 brake horsepower at 2600 rpm. Fuel capacity is 50 gallons located in one fuel tank. Tires are 10-ply rated 9.00x20. The payload is 1000 gallons of water.

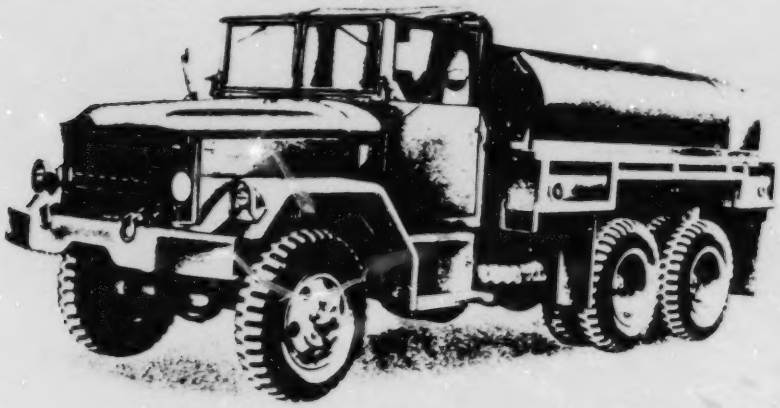


Fig 1-5. 2-1/2-ton 6x6 water truck M50 - left front view.

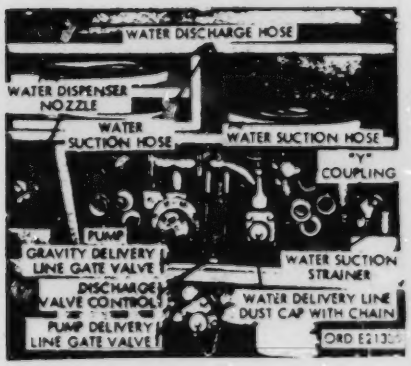


Fig 1-6. Water tank truck rear compartment showing stowed equipment.

Several types of van bodies are provided for such uses as fire control data, repair shop, computers, etc.

The most popular van found in motor transport is the M109A2 (fig 1-7) shop van truck. They are powered by an in-line 6 cylinder continental engine multifuel, brake horsepower is 140 at 2600 rpm. Tires are 10-ply rated 9.00x20. Payload on the highway is 10,000 pounds.

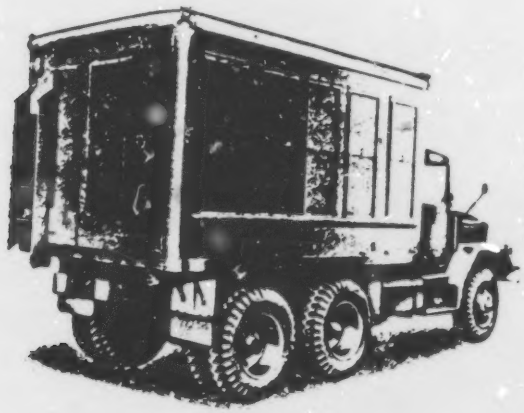


Fig 1-7. 2-1/2-ton 6x6 shop van truck M109 - right rear view.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. List the four general characteristics of M-Series tactical trucks.

   a. _____
   b. _____
   c. _____
   d. _____

2. Name the four basic wheel base chassis.

   a. _____
   b. _____
   c. _____
   d. _____

Section II. TRUCK SYSTEMS

Work Unit 1-2. POWER PLANT SYSTEM

IDENTIFY THE NUMBERS OF CYLINDERS IN THE MULTIFUEL ENGINE SYSTEM.

STATE THE TWO WAYS AIR IS DRAWN THROUGH THE RADIATOR.

LIST THE SIX COMPONENTS FOUND IN THE FUEL SYSTEM.

NAME THE TYPE OF MUFFLER EQUIPMENT EQUIPPED ON THE M49A2C FUEL TANKER TRUCK.

All M-Series 2 1/2-ton tactical trucks in the Marine Corps are equipped with an in-line 6 cylinder multifuel engine (fig 1-8). The engine model is the LD 465-1C which uses the fuel injected compression ignition principle. Lubrication order (LO 9-2320-209-12) permits authorized fuel that can be used.

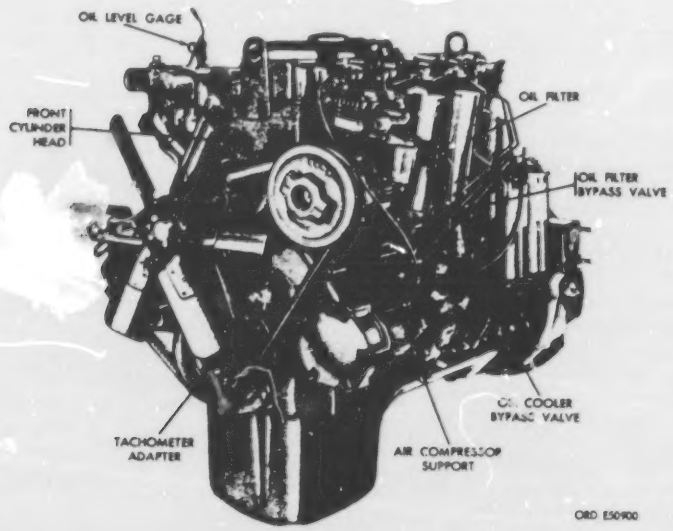


Fig 1-8. LD465-1C multifuel engine.

The LD465-1C engine delivers 140 brake horsepower at 2600 rpm.

The engine incorporates a sealed-type cooling system. It consists of the radiator, fan, drive belts, thermostat, water pump, temperature gage, pressure-type filler cap, thermostat by-pass line, hose lines, and fittings that connect the radiator to the engine and water pump.

The operation of the cooling system is simple. Water is drawn from the bottom of the radiator by water pump action, circulated through the engine, and returned to the radiator through the upper connections. Air, drawn through the radiator core by the fan and by truck motion, cools the water to maintain correct engine operating temperature.

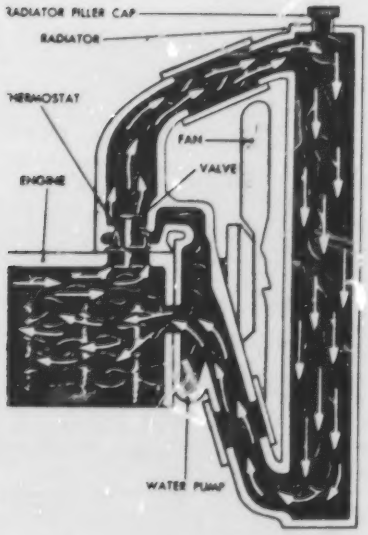


Fig 1-9. Cooling system.

For vehicles powered by the multifuel engine, the fuel system consists of a fuel tank, fuel lines, supply pump, filters, injector pump, injection nozzles, and connectors.

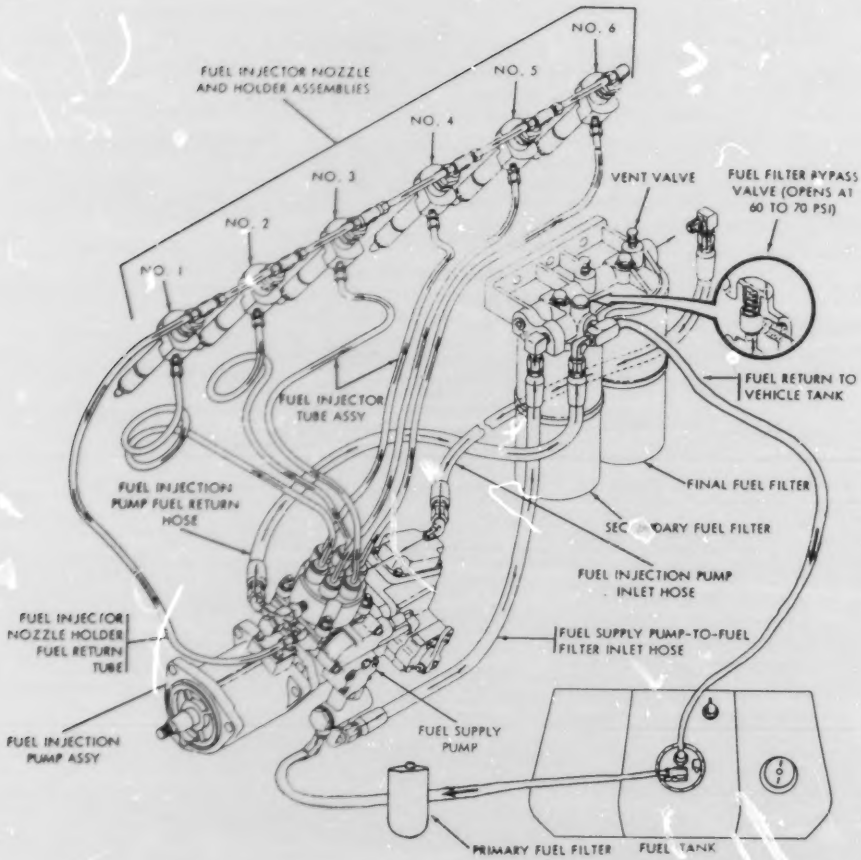


Fig 1-10. Engine fuel system diagram.

The exhaust pipe is connected directly to the exhaust manifold. Most 2 1/2-ton tactical trucks use a stack exhaust. The stack pipe is mounted on the right side of the truck and extends above the cab top. A muffler is located between the exhaust pipe and the stack pipe. The M49A2C fuel tanker is equipped with a spark arrestor type muffler which traps exhaust sparks from the engine.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. Identify the number of cylinder(s) in the multifuel engine system.

   a. 4
   b. 5
   b. 6
   c. 8

2. State the two ways air is drawn through the radiator.

   _____

   _____

3. List the six components found in the fuel system.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

4. The type of muffler equipped on the M49A2C fuel tanker truck is _____

_____

Work Unit 1-3. POWER TRAIN SYSTEM

NAME THE TYPE OF TRANSMISSION USED ON THE 2 1/2-TON M-SERIES VEHICLES.

NAME THE SERVICE BRAKE SYSTEM USED ON THE 2 1/2-TON M-SERIES TRUCK.

STATE THE TYPE OF SPRING USED ON THE FRONT AXLE OF THE 2 1/2-TON TRUCK SUSPENSION SYSTEM.

STATE THE TWO IMPORTANT CONTROLS AND LINKAGE NECESSARY TO OPERATE THE 2 1/2-TON M-SERIES TRUCK.

Several of the powertrain system components (Fig 1-11) will be discussed here.

The first component in the power train system is the clutch assembly. The two purposes of the clutch is to connect and disconnect the engine from the power train. It also provides for a gradual engagement of the power train.

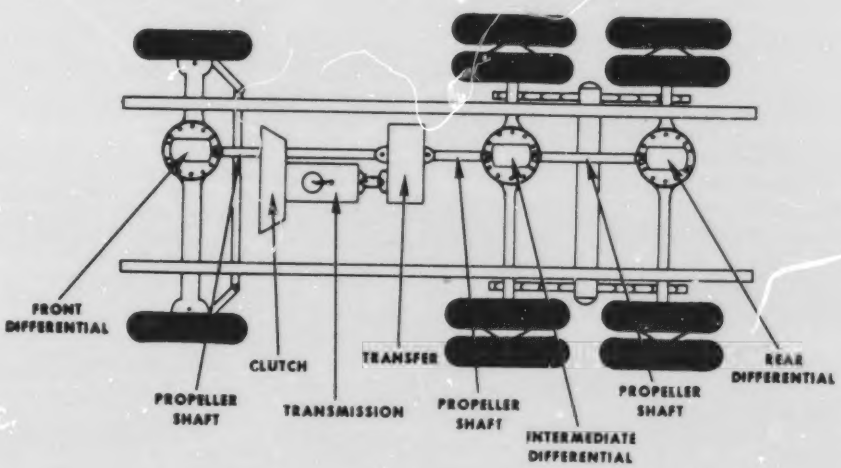


Fig 1-11. Power train system.

The transmission is a manually operated synchromesh type, mounted on the rear of the engine. It provides one reverse and five forward speeds.

The transfer assembly, mounted behind the transmission, transmits power from the transmission assembly to the front and rear propeller shafts. It also provides two driving ratios for each of the transmission speeds.

Some vehicles are equipped to provide power for operation of auxiliary equipment. A single-end power take off is used on trucks equipped with a front winch. This power take off is attached and driven by the transmission.

Some vehicles are equipped with a transfer power take off to provide power for the operation of auxiliary equipment. The transfer power take off is attached to the rear of the transfer, and is controlled by a lever in the cab. It is used to drive pumps for the water and fuel tanker trucks.

Propeller shaft assemblies transmit power from the transmission to the transfer and from the transfer to the axles. Driveshaft assemblies transmit power from the power take off assemblies to the auxiliary equipment. With the exception of the water and fuel tanker trucks, all drive shafts are of double U-joint type. The water and fuel tanker truck shafts are solid, and are supported at each end by a flange or pillow block with a bearing assembly.

The front springs are semielliptical with the long leaf on the top and mounted on spring seats resting on the front axle. The hydraulic shock absorbers are connected to the frame side member and lower "U" bolt bracket on the front axle. The rear springs are mounted in an inverted position as compared with the front springs. They are also semielliptical and mounted on a spring seat cross shaft. The ends are free to slide in guide brackets mounted on the axle housings. Driving and braking forces are transmitted to the chassis by a system of torque rods arranged to maintain vertical position of the rear-axle drives regardless of uneven road surfaces.

The service brake system is an air-operated hydraulic system composed of a master cylinder, air-hydraulic cylinder, individual hydraulic wheel cylinders, lines for hydraulic fluid, and linkage to operate the system. The parking brake consists of a brake drum mounted on the rear-output shaft of the transfer, with inner and outer brake shoes operated by a single shoe lever. A cable attached to the brakeshoe lever runs through a protective casing to the handbrake lever at the left of the driver's seat. The compressed air system is used for the service brake air-hydraulic cylinder assembly, windshield wiper motor assemblies, trailer air brakes, and tire inflation. It can also be used for emergency cleaning of the air cleaners on multifuel engine vehicles. The system consists of reserviors, control valves, couplings, piping and fittings, and is generally identical on all vehicles. This system actuates the low air pressure warning buzzer when the air pressure is not sufficient to operate the vehicle brakes (Fig 1-12).

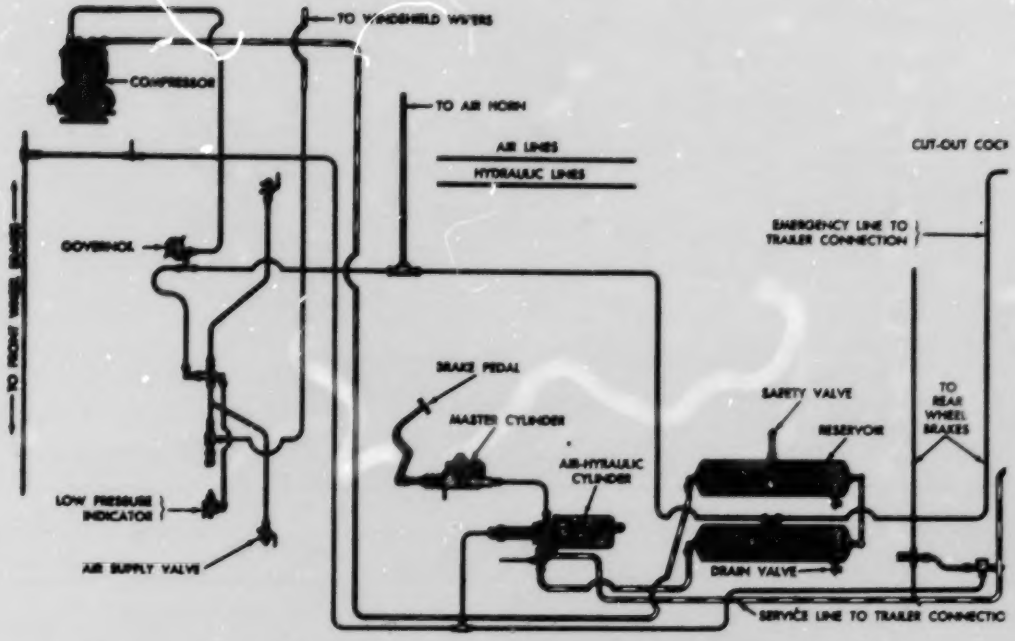


Fig 1-12. Air actuated hydraulic brake system.

The steering system consists of a steering wheel, a helical cam and lever-type steering gear, pitman arm drag link, and tie rods. Rotation of the steering wheel, by the driver, is transmitted through the steering gear, pitman arm, drag link, and tie rod to steer the front wheels of the truck.

The controls and related linkages are necessary for the operation of the vehicle and mounted equipment. Some of the important linkage and controls are accelerator pedal, clutch pedal, service brake pedal, handbrake lever, transmission shift lever, and transfer shift lever. Other controls and linkages are transmission power takeoff control lever, windshield wiper motor pressure regulator, throttle control assembly and engine stop control assembly.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The type of transmission used on the 2 1/2-ton M-Series vehicles is _____.

2. What is the type of service brake system used on the 2 1/2-ton M-Series truck?

_____

3. The type of spring used on the front axle of the 2 1/2-ton truck suspension system is _____.

4. What are the two important control and linkages necessary to operate the 2 1/2-ton M-Series truck?

_____

_____

Work Unit 1-4. CHASSIS SUPPORT SYSTEM

STATE THE QUANTITY OF 12-VOLT STORAGE BATTERY(S) USED IN THE ELECTRICAL SYSTEM.

LIST FOUR REASONS FOR THE BREATHER AND VENTILATION SYSTEM.

The electrical system is a 24-volt dc system; two 12-volt storage batteries are connected in series with the negative terminal grounded. The engine starter motor operates directly from the 24-volt source. The electrical system use a belt-driven, 24-volt dc generator, having an output capacity of 25 amperes. The electrical system provides operating voltage for the vehicle lighting system, the electrical gages on the instrument panel, horn operation, and manifold heater. A trailer electrical coupling is located at the rear of the vehicle.

The components of the breather and ventilation systems on the multifuel models are used for ventilation, exhaust, prevention of vacuum, and also prevention of excessive pressure and entrance of water during a fording operation. These operations are accomplished by using breather lines, ventilating and breather valves, and a crankcase breather.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The quantity of 12-volt storage battery(s) used in the electrical system is _____

2. Four reasons for the breather and ventilation system are

   a. _____

   b. _____

   c. _____

   d. _____

Section III. MODEL VARIATION 2 1/2-TON

Work Unit 1-5. 2 1/2-TON MODEL CHARACTERISTICS

STATE THE LENGTH OF THE M35A2C CARGO BED.

STATE THE NUMBER OF TANK COMPARTMENTS USED BY THE M49A2C FUEL TANKER TRUCK.

STATE THE GALLON CAPACITY OF THE M50A2 WATER TANKER TRUCK.

The M35A2C (fig 1-1 and 1-2) cargo trucks have 12-foot beds, and the M36A2C has a 17-foot bed with lowerable right body side panels. Removeable wooden cargo racks may be mounted at the front and sides of the body. The lower portion of the side racks is used as a troop carrier. Sockets are provided for the installation of top bows and a paulin. The end curtains and lower edges of the paulin are secured with rope lashing. The rear of the body is closed by a hinged end gate.

The M49A2C (fig 1-3) fuel servicing tank truck has a 1200-gallon capacity tank body that is divided into two 600-gallon compartments. Access to each compartment is through a manhole, equipped with a manhole cover and filler cover assembly. Side skirts and running boards on each side of the tank body have sockets for mounting top bows and top paulin with end covers for camouflage.

Tank body sections can be filled or emptied by using the delivery pump mounted in the rear compartment. The pump is driven from the transfer power takeoff mounted on the transfer case. The delivery line gate valve assemblies and the two fuel dispensers with nozzle assemblies are provided to control the discharge of fuel. The tank body shell is extended beyond the rear tank bulkheads to form a pump compartment at the rear of the body. The tank truck M49A2C is equipped with a multifuel engine.

The M50A2C (fig 1-5) water tank truck uses a 1000-gallon capacity water tank body that is divided into 400- and 600-gallon compartments. Access to each compartment is through a manhole equipped with inner and outer manhole covers. Each compartment is filled through a filler cover and strainer. Delivery pump and valve controls are mounted in a rear compartment. Tank sections can be filled or emptied by use of the delivery pump which is driven by the transfer power take off. Two delivery line gate valves, two water nozzles, and three discharge hoses are provided to control the discharge of water. An insulated heating chamber below the tank is connected by the exhaust bypass valve and the fording valve assembly which protects the tank or pipes against freezing. Running board and side skirts on each side of the tank have sockets for installation of the top bows and paulin with end curtains for camouflage. On the M50A2 multifuel engine tank truck, the proper engine speed during delivery pump operation is 1000 rpm to 1100 rpm as observed on the tachometer. This is controlled by the operator using the hand throttle.

While working in the Marine Corps, you will probably drive or repair a van truck, 2 1/2-ton, M109A2, equipped with the multifuel engine. The trucks have 12-foot van bodies, mounted on subsills to raise the body and eliminate the need for wheel housings. Access doors close the rear of the body. The right access door is equipped with a latch which can be padlocked. The left access door can be opened only from the inside of the body. Ladders are provided for access to the inside of the van and access to the roof of the van. The body has side windows with screens and blackout curtains, and a front communication door. Vans are provided with 24 volts dc and 115 volts ac power. Heating and ventilating accessories are available to provide satisfactory working conditions in temperatures from +125°F. to -25°F. The body is waterproof, and can ford to a depth of 8 feet. Some van trucks are equipped with the hardtop cab closure or canvas top closure. Lifting brackets, by which the completely loaded van body may be supported, are installed in the upper corners of the body.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The length of the M35A2C cargo bed is _____.

2. The number of tank compartments used by the M49A2C fuel truck is _____.

3. The gallon capacity of the M50A2 water tanker truck is _____.

SUMMARY REVIEW

In this first study unit you were introduced to the 2 1/2-ton M-Series tactical trucks. You learned the model variations. In study unit 2, you will be introduced to the 5-ton M-Series tactical trucks and their model variations.

Answers to Study Unit #1 Exercises

Work Unit 1-1.

1. a. Highways and crosscountry use
   b. Fording capabilities
   c. Ten speed ranges provided
   d. All wheel drive
2. a. cargo body
   b. fuel tanker
   c. water tanker
   d. van tanker

Work Unit 1-2.

1. c.
2. a. By the fan
   b. Vehicle motion
3. a. Fuel tank
   b. Fuel lines
   c. Fuel filters
   d. Supply pump
   e. Injector pump
   f. Injector nozzles
4. spark arrestor type

Work Unit 1-3.

1. synchromesh
2. Air operated hydraulics
3. leaf type
4. a. Service brake pedal
   b. Accelerator pedal

Work Unit 1-4.

1. a. two
2. b. Ventilation
   c. Exhaust
   d. Vacuum prevention
   e. Entrance of water during fording

Work Unit 1-5.

a. 12 feet
b. two
c. 1,000 gallons

STUDY UNIT 2
5-TON AND 10-TON M-SERIES TACTICAL TRUCKS

STUDY UNIT OBJECTIVE: UPON SUCCESSFUL COMPLETION OF THIS STUDY UNIT, YOU WILL IDENTIFY THE 5-TON 6x6 M-SERIES TACTICAL TRUCK AND THE DIFFERENCES BETWEEN MODELS. IN ADDITION, YOU WILL IDENTIFY THE 10-TON 6x6 M-SERIES TRUCK TRACTOR.

Now that you have been introduced to the 2 1/2-ton M-SERIES trucks, take a look at the 5-ton M-SERIES. The Marine Corps is currently using three different M-SERIES 5-ton vehicles.

Section I. 5-TON M-SERIES TACTICAL TRUCK

Work Unit 2-1. CHARACTERISTICS

STATE THE CORRECT FORDING DEPTH THAT CAN BE REACHED BY THE 5-TON M-SERIES TRUCK WITH A FORDING KIT.

This study unit covers the 5-ton 6x6 trucks. These vehicles are designed for use over all types of roads, highways, and cross-country terrain, and in all types of weather. They will ford hard bottom water crossings to a depth of 30 inches without a deep water fording kit, and 78 inches with a deep water fording kit. All the trucks are equipped with a six cylinder, multifuel or straight diesel engine. Each has a 5-speed manually operated or automatic shift transmission, and a 2-speed transfer which provides the vehicle with an all-wheel drive capability. The vehicle cab has a removable canvas paulin. The cargo truck bodies are provided with bows, removable canvas top paulins, and end curtains. All vehicles are equipped with a spare wheel(s) and tire(s) and a pintle hook at the rear for towing a trailer. These are some of the basic characteristics of the 5-ton M-SERIES vehicles.

EXERCISE: Answer the following question and check your response against the one listed at the end of this study unit.

1. What is the correct fording depth that can be reached by the 5-ton series truck with a fording kit?

Work Unit 2-2. M39 SERIES (MULTIFUEL)

STATE HOW AIR IS INDUCTED INTO THE MULTIFUEL ENGINE.

STATE HOW THE M39 SERIES TRANSMISSION IS OPERATED.

The M39 SERIES (multifuel) tactical 5-ton trucks are equipped with an in-line 6 cylinder multifuel engine (fig 2-1). This engine is equipped with a turbocharger which provides added horsepower. Air is inducted into the engine by an exhaust gas driven turbocharger. It is a liquid-cooled compression ignition engine located at the front end of the truck. A 5-speed manually operated transmission and a 2 speed transfer provides 10 speed ranges. Front wheel drive is automatically engaged when the rear wheel loses traction. High or low ranges in the transfer are selected with a lever in the cab, by the operator when needed.

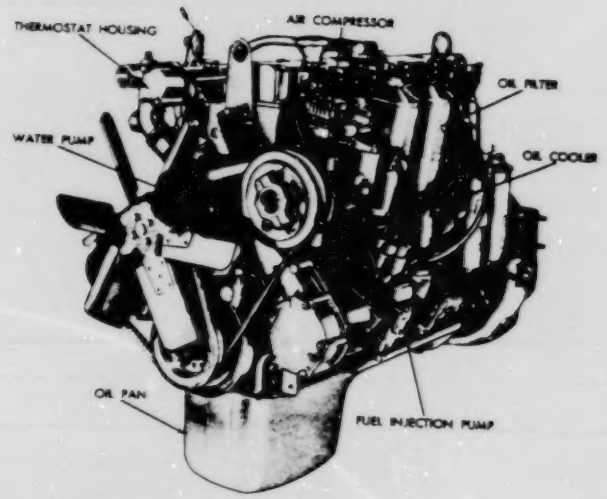


Fig. 2-1. Turbocharged LSD 465-1C.

The fuel system is nearly identical to that of the 2 1/2-ton M-Series, except that some models will incorporate two fuel tanks in lieu of one tank (example: M52A2 truck tractor).

The exhaust pipe is connected directly to the turbocharger in lieu of an exhaust manifold. The stack pipe is mounted on the right side of the truck and extends above the cab top.

The electrical system, service brakes system, power train system, and suspension system are the same as the systems found in the 2 1/2-ton truck. The truck has the same capabilities but is a somewhat heavier duty vehicle.

The M39 series vehicle has a power assisted steering system which incorporates a power steering pump, power cylinder, hydraulic lines and connectors.

As a Marine, you will see the following models of 5-ton M39 Series trucks.

Fig 2-2. M54A2C truck cargo

This multifuel engine equipped vehicle has a 179-inch wheelbase with 11:00x20 tires and dual rear wheels. The cargo sides are hinged along the sides where the cargo bed joins to permit side loading.

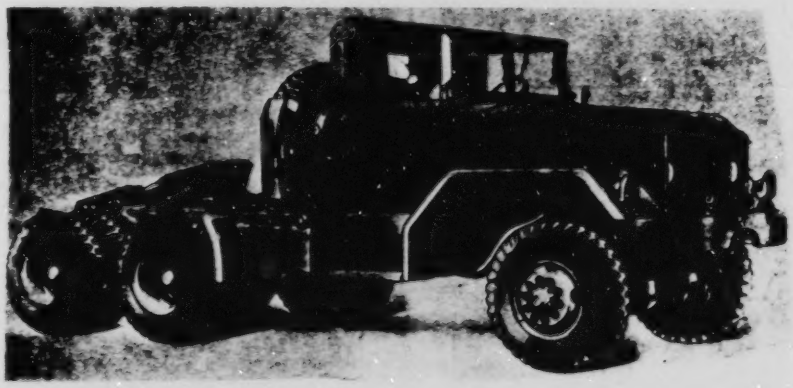


Fig 2-3. M52A2 truck tractor.

The 5-ton 6x6 tractor truck M52A2 has a 167-inch wheelbase, with 11:00x20 tires and dual rear wheels. A fifth wheel assembly, approach plates, and deck plate, suitable for hauling trailers, are mounted on the rear of the chassis. Tractor to trailer brake hoses and connections are mounted behind the cab. The M52A2 is equipped with a multifuel engine.

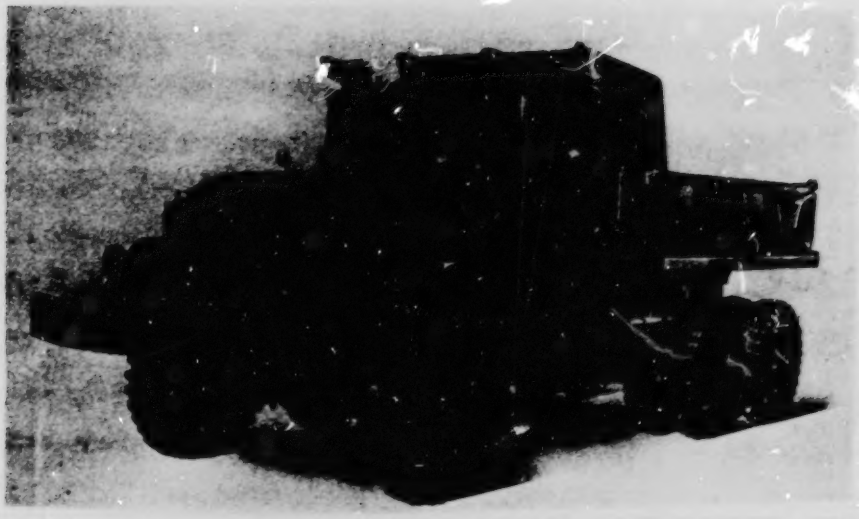


Fig 2-4. M51A2 dump truck.

This 5-ton, 6x6 dump truck has a 167-inch wheelbase with 11:00x20 tires and dual rear wheels. A 5-cubic yard capacity dump body and twin-cylinder hoist assembly are mounted on the rear of the chassis.

Fig 2-5. Medium wrecker truck M543A2.

The 5-ton, 6x6, wrecker trucks have a 179-inch wheelbase with 11:00x20 tires and dual rear wheels. A hydraulic crane and winch assembly are mounted on the rear of the chassis. The M543A2 is equipped with a multifuel engine.

You were just acquainted with the M39 Series, multifuel equipped 5-ton.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. Air is inducted into the multifuel engine by _____.

2. The M39 Series transmission is _____ operated.

Work Unit 2-3. M809 SERIES (CUMMINS)

STATE THE RATED HP OF THE CUMMINS ENGINE EMPLOYED BY THE M809 SERIES 5-TON.

STATE WHY AN INTAKE MANIFOLD PREHEATER IS USED.

STATE THE NUMBER OF STORAGE BATTERIES USED IN ALL M809 SERIES TACTICAL TRUCKS.

The 5-ton, 6x6 trucks covered in this work unit are all of the M809 Series. The model types have various wheel bases and body styles. They all have a tandem rear axle and dual rear wheels. All models are powered by a 250 horsepower Cummins (NHL 250) diesel engine. The engine is a compression ignited in-line 6 cylinder, naturally aspirated, liquid-cooled engine (fig 2-6). Naturally aspirated means air is inducted into the engine naturally, without the aid of a turbo or supercharger.

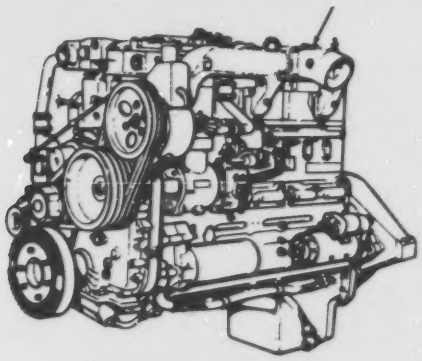


Fig 2-6. Cummins (NHL 250) engine.

A 5-speed, manually operated transmission and a two-speed transfer case which transmits power to the front and rear axle are incorporated into the power train.

The fuel system consists of a fuel tank(s), a combination fuel filter/water separator, fuel pump, six injectors and inter-connecting lines and hoses. The fuel pump used on the medium wrecker, M816, is equipped with a variable speed governor to automatically adjust engine speed to compensate for loads imposed during crane operation.

The engine is equipped with an intake manifold preheater for heating inducted air during cold weather starting. Atomized fuel is sprayed onto the preheater glow plug from the hand primer pump. The ignited air/fuel mixture is preheated here to aid in cold weather starting.

Exhaust gases from the engine are routed through a muffler and a vertical exhaust stack on the right side of the vehicle. The vertical position of the exhaust stack is covered with a protective grill to guard against accidental body contact by personnel.

The electrical system is a 24-volt dc system. Four 12-volt storage batteries are connected in series parallel, with negative terminals that are grounded. The engine starter operates directly from the 24-volt source. The system uses a 24-volt alternator with an output capacity of 60 amperes. This provides operating voltages for the vehicle lighting system; instrument panel; horn operation; fuel injection pump solenoid; directional signals and four way warning flashers.

The brake system is an air/hydraulic type consisting of a master cylinder and an air hydraulic cylinder. Each wheel has individual wheel cylinders. The handbrake consists of a brake drum mounted on the transfer rear output shaft. Inner and outer brake shoes are connected by a cable operated by a lever in the vehicle cab.

The steering system differs from the M39 Series vehicles. The hydraulic assisted steering consists of a hydraulic steering pump and a hydraulic cylinder to furnish a power steering system to assist the operator.

The suspension system is identical to the M39 Series 5-ton, and is heavier duty than the 2 1/2-ton M-Series vehicles.

Now you will be introduced to illustrations of the M809 Series 5-ton found in today's Marine Corps.

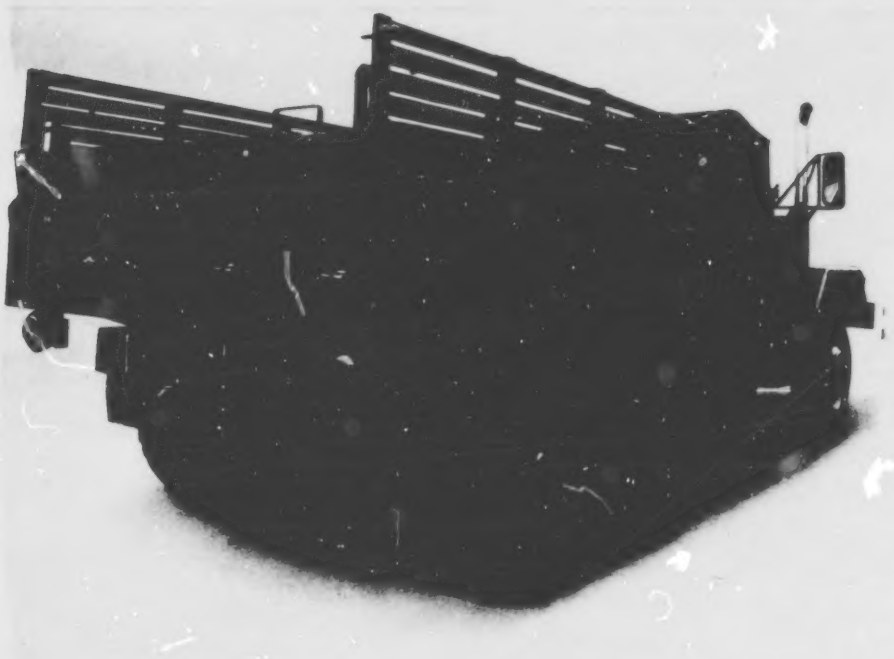


Fig 2-7. M813A1 cargo dropside truck.

The truck in figure 2-7 has a 179-inch wheel base, 11:00x20 tires with a 14-foot x 7-foot flat bed cargo box (550 cubic feet). The dropside feature provides a 147 1/2-inch access opening on each side. This vehicle employs a Cummins(NHL 250) diesel engine.

The vehicle in figure 2-8 is the M816 medium wrecker. It has a [illegible]-inch wheel base, and 11:00x20 tires and a 20,000 pound capacity hydraulically operated crane with a 10-foot to 18-foot boom.

Fig 2-8. M816 medium wrecker truck.

Fig 2-9. M818 truck tractor.

This truck has a 167-inch wheel base, 11:00x20 tires, a universal 33-inch fifth wheel, approach, and deck plates. Tractor to trailer brake hoses and connections are mounted behind the cab. This vehicle also employs the Cummins 250 diesel engine.

On the M809 Series 5-ton vehicle, the Marine Corps made a one-time purchase of 789 vehicles. They were fielded in July through December 1980.

In this work unit you have seen the comparison between the M809 Series and the M39 Multifuel Series. You have found a different engine, steering system, and electrical system.

EXERCISE: Answer the following questions and check your responses against those located at the end of this study unit.

1. The rated horsepower of the Cummins engine employed by the M809 SERIES vehicle is _____.

2. An intake manifold preheater is used to _____.

3. The number of storage batteries used in all M809 Series tactical trucks is _____.

Work Unit 2-4. M939 SERIES (CUMMINS)

NAME THE TYPE OF TRANSMISSION USED ON THE M939 SERIES VEHICLE.

STATE THE TYPE OF SERVICE BRAKE SYSTEM USED ON THE M939 SERIES VEHICLES.

The newest 5-ton M-Series vehicle found in the Marine Corps is the M939 Series. In this work unit, you will read about and see the many improvements and changes comparing this vehicle with the M39 Series and M809 Series.

Some of the similarities are: fording and all wheel drive capabilities, the removable canvas paulin on the vehicle cab, and cargo truck bodies provided with bows. The trucks also have removable canvas top paulins and end curtains. All vehicles are equipped with a spare wheel(s) and tire(s) and a pintle hook at the rear for towing a trailer. It is powered by a Cummins 250 diesel engine. The electrical and steering system are identical to the M809 Series vehicles.

Some of the differences of the M939 Series are located in the powertrain systems (fig 2-10). First of all, it is equipped with a 5-speed MT.654 fully automatic transmission. The transmission control system permits the operator to shift into reverse, neutral and five forward speeds. This system also permits the operator to engage a transmission power take off (PTO) to provide power to auxiliary equipment.

The transfer case allows power to be divided to both a front and rear propeller shaft. This gives the vehicle front wheel drive capabilities. Also the power train is the same on all M939 Series vehicles. Major components of the powertrain are:

A ENGINE. Provides horsepower needed to move power train components.

B TRANSMISSION. Adapts engine horsepower to meet different driving conditions.

C CENTER BEARING. Provides support for propeller shaft to decrease vibration and wear to universal joints.

D TRANSFER. Adapts driving power to front and rear axles.

E UNIVERSAL JOINTS. Flexible connections between two propeller shafts that permit one to drive the other even though they may be at different angles.

F DIFFERENTIALS. Adapts power to left and right axle shafts independently so vehicle can make turns without skidding.

G AXLES. Adapts power from differentials to rotate wheels.

H PROPELLER SHAFTS. Serve as driving shafts that connect the transmission's main shaft to the differential or rear axles. They also connect the transfer to the front differential or axles.

1. Rear-to-forward rear differential propeller shaft.
2. Forward rear differential-to-transfer propeller shaft.
3. Transfer-to-transmission propeller shaft.
4. Transfer-to-center bearing propeller shaft.
5. Center bearing-to-front differential propeller shaft.

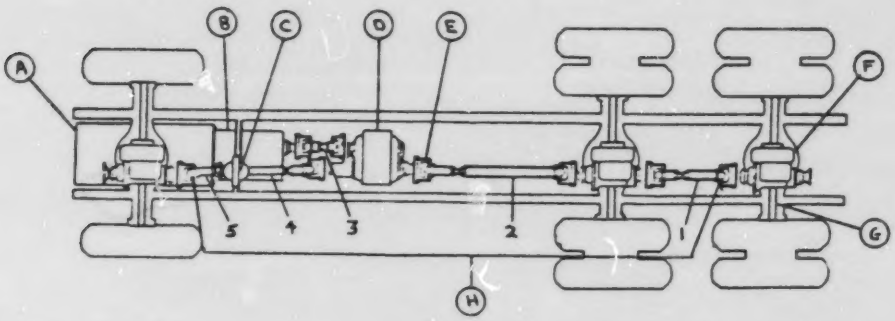
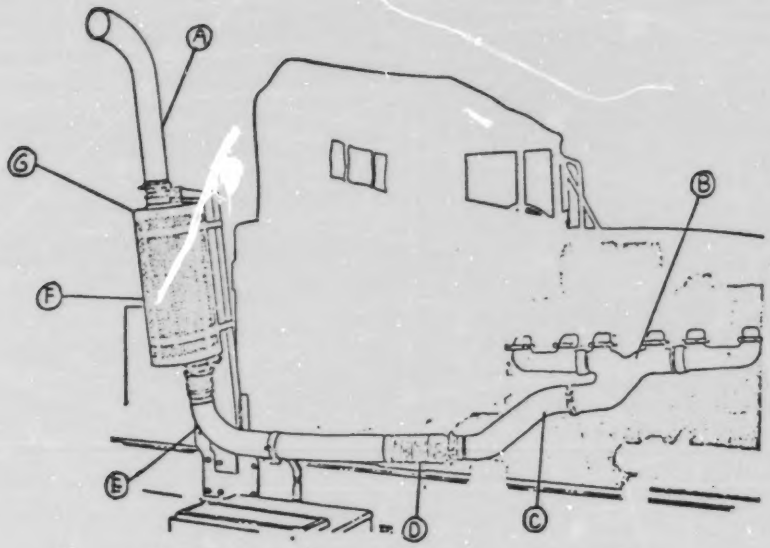


Fig 2-10. M939 powertrain system.

The transfer provides a 2-speed gear selection. The transfer control system allows the operator to engage front wheel drive by operating a selector switch from right to left located on the left side of the dash instrument panel. The transfer speed ranges can be selected by the driver with a control lever located in the cab of the truck.

The exhaust system (fig 2-11) is connected directly to the exhaust manifold of the engine and is routed to a flex pipe to absorb vibrations. The exhaust system also goes through a vertical muffler. Connected above the muffler is a stack pipe that directs the used engine gases away from the vehicle (fig 2-11).



A EXHAUST STACK
B EXHAUST MANIFOLD
C FRONT EXHAUST PIPE
D FLEX PIPES
E REAR EXHAUST PIPE
F MUFFLER
G MUFFLER SHIELD

Fig 2-11. M939 Series exhaust system.

The air intake system channels and cleans the air going to the combustion chamber, where it is mixed with fuel. The components are illustrated in figure 2-12.

C AIR INTAKE EXTENSION TUBE. Routes air to air intake system. Can be removed for shipping.

D AIR INTAKE TUBE. Routes air to air filter and is high enough to keep intake point above fording level.

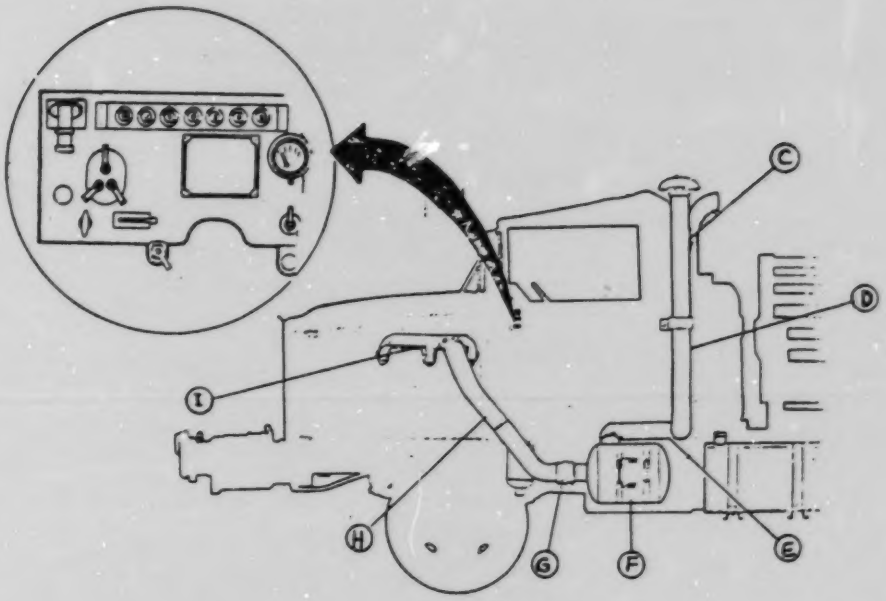
E STACK-TO-AIR FILTER ELBOW. Flexible connection between air stack and filter.

F AIR FILTER. Filters dirt and dust from air before it enters combustion chamber.

G HUMP HOSE. Flexible connection between air cleaner and air cleaner outlet tube.

H AIR CLEANER OUTLET TUBE. Routes air from air cleaner to intake manifold.

I INTAKE MANIFOLD. Carries air to various combustion chambers in cylinder head.

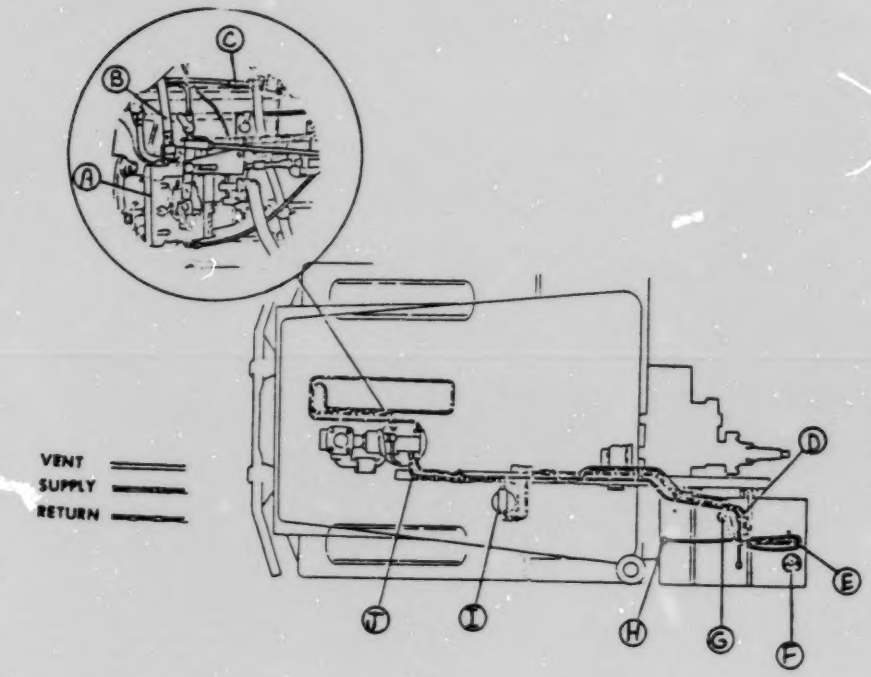


C AIR INTAKE EXTENSION TUBE
D AIR INTAKE TUBE
E STACK-TO-AIR FILTER ELBOW
F AIR FILTER
G HUMP HOSE
H AIR CLEANER OUTLET TUBE
I INTAKE MANIFOLD

Fig 2-12. Air intake system.

The purpose of the fuel system is to store, clean, and supply fuel to the fuel injectors where it is mixed with air to initiate engine combustion. The fuel system is not identical for all models. They differ in the number of tanks, either one or two tank systems, and they also differ in capacity.

Study figures 2-13 and 2-14 to see the differences in the systems and the model applications.

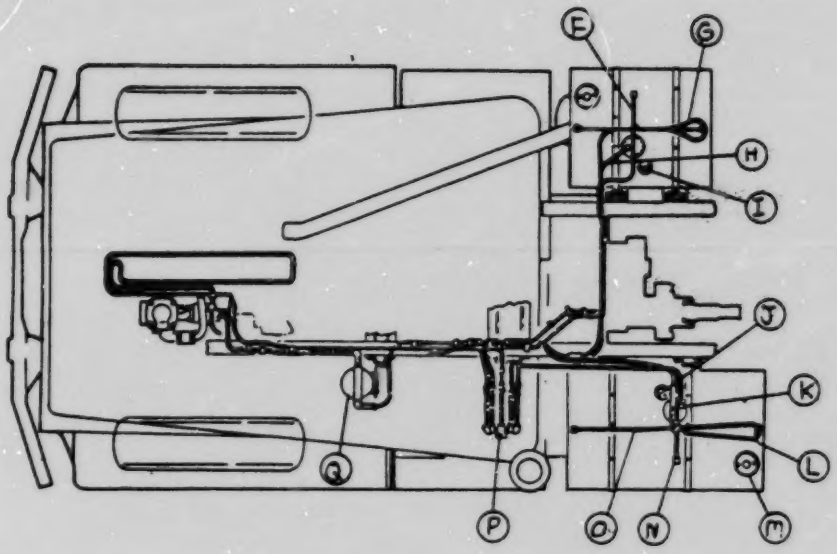


A	FUEL PUMP	F	TANK FILLER CAP
B	PUMP-TO-COMBUSTION CHAMBER SUPPLY LINE	G	FUEL LEVEL SENDING UNIT
C	COMBUSTION CHAMBER-TO-TANK RETURN LINE	H	TANK (FRONT) VENT LINE
D	FUEL TANK-TO-FILTER SUPPLY LINE	I	FUEL FILTER
E	TANK (REAR) VENT LINE	J	FILTER-TO-PUMP SUPPLY LINE

Fig 2-13. Single tank fuel system.

Single tank models:

M923 Cargo Truck



F	RIGHT TANK FUEL RETURN LINE	L	LEFT TANK (REAR) VENT LINE
G	RIGHT TANK (REAR) VENT LINE	M	LEFT TANK FUEL CAP
H	RIGHT TANK FUEL SUPPLY LINE	N	LEFT TANK FUEL RETURN LINE
I	RIGHT TANK FUEL LEVEL SENDING UNIT	O	LEFT TANK (FRONT) VENT LINE
J	LEFT TANK FUEL LEVEL SENDING UNIT	P	FUEL SELECTOR VALVE
K	LEFT TANK FUEL SUPPLY LINE	Q	FUEL FILTER

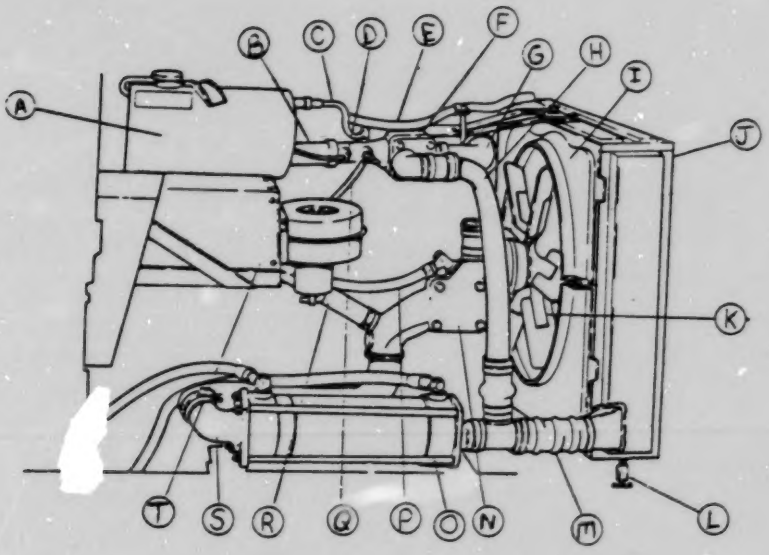
Fig 2-14. Dual tank fuel system.

Dual tank models:

M929 Dump Truck
M931 Tractor Truck
M936 Wrecker Truck

On the M939 Series vehicles you will find a different cooling system. On the right side of the engine, you will see a transmission oil cooler as part of the cooling system (fig 2-15).

The cooling system takes away waste heat from the engine, engine oil, and transmission oil. Major components are identified in figure 2-15.



A	SURGE TANK	L	RADIATOR DRAINCOCK
B	WATER MANIFOLD	M	RADIATOR-TO-TRANSMISSION OIL COOLER HUMP HOSE
C	SURGE TANK-TO-WATER MANIFOLD VENT HOSE	N	ENGINE OIL COOLER
D	TEMPERATURE GAGE SENDING UNIT	O	TRANSMISSION OIL COOLER
E	SURGE TANK-TO-RADIATOR VENT HOSE	P	ENGINE OIL COOLER-TO-HEATER HOSE
F	THERMOSTAT	Q	HEATER-TO-WATER MANIFOLD HOSE
G	RADIATOR INLET HOSE	R	SURGE TANK-TO-ENGINE OIL COOLER HOSE
H	BY-PASS TUBE	S	TRANSMISSION OIL COOLER-TO-ENGINE OIL COOLER HOSE
I	RADIATOR SHROUD	T	PERSONNEL WATER HEATER
J	RADIATOR		
K	FAN BLADES		

Fig 2-15. Cooling system components.

The M939 Series vehicle is equipped with a compressed/air and brake system. The compressed air and brake system takes filtered air, compresses it, and supplies it to various components that enable the operator to slow down or stop the vehicle. The system also supplies compressed air to air actuated accessories throughout the vehicle. In other words, the M939 Series vehicle incorporates a straight air brake system.

The M939 Series is replacing the corresponding 2 1/2-and 5-ton series vehicles. Their mission roles are to transport cargo, personnel, and weapon systems.

Now you will see what the Marine Corps newest 5-ton vehicle looks like.

The M923 is used for hauling cargo and troops. Removable bed sides permit hauling extra wide loads and easy access for unloading cargo (fig 2-16).

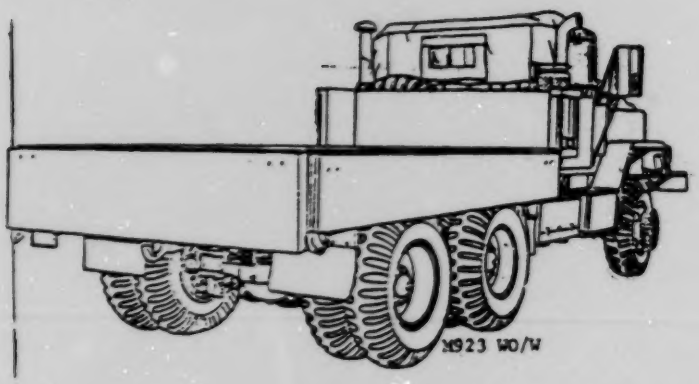


Fig 2-16. Truck cargo M923.

The purposes of the M929/930 trucks are hauling and dumping cargo. See figure 2-17 and 2-18.

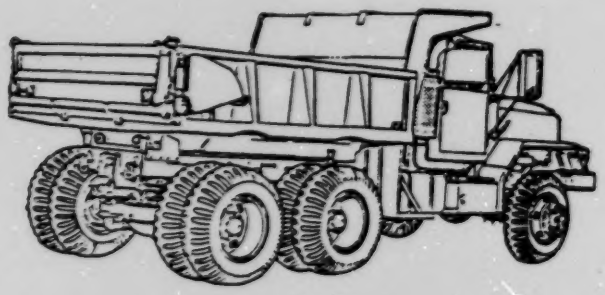


Fig 2-17. Dump truck M929 without winch.

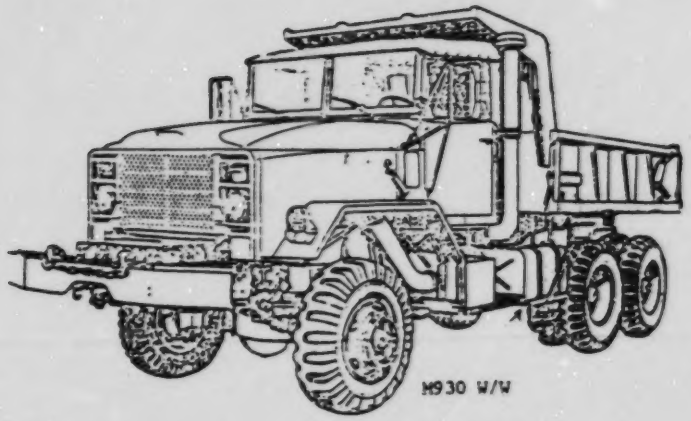


Fig 2-18. Dump truck M930 with winch.

These models are used for hauling semi-trailers. The M932, which has a winch, can also be used for salvage operations (study figures 2-19 and 2-20).

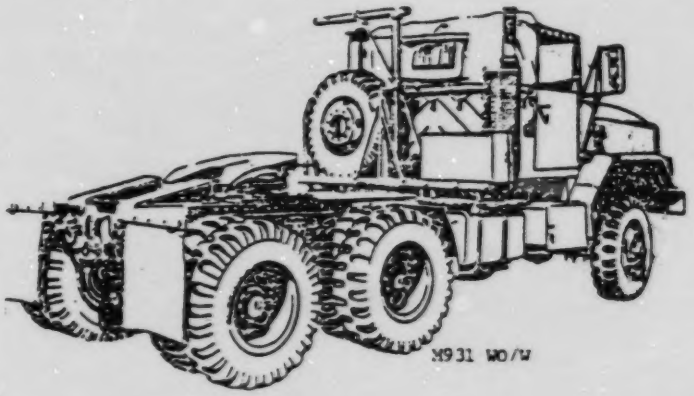
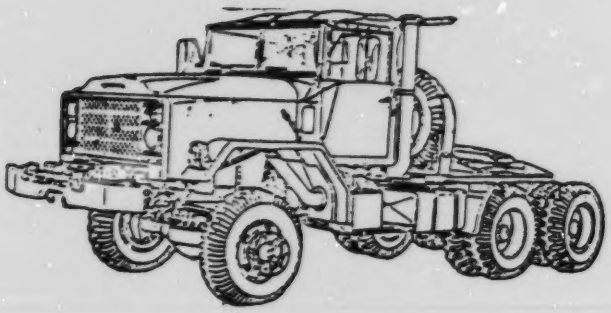


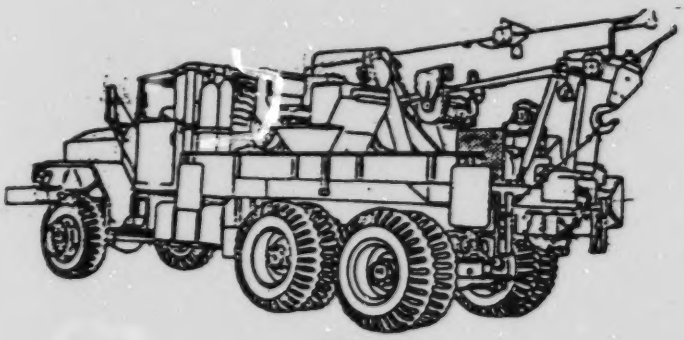
Fig 2-19. Tractor M931 without winch.



M932 W/W

Fig 2-20. Tractor M932 with winch.

The medium wrecker truck, model M936, is used for wrecking and salvage operations. It also has a crane lifting capacity of 20,000 pounds. See Figure 2-21.



M936 W/W

Fig 2-21. Truck medium wrecker.

You have just been introduced to the new M939 Series 5-ton vehicles.

EXERCISE: Answer the following questions and check your answers against those listed at the end of this study unit.

1. The type of transmission used on the M939 SERIES vehicle is _____.

2. State the type of service brake system used on the M939 SERIES vehicle.

_____.

Work Unit 2-5. M39 SEIRES RETROFIT

STATE THE TYPE ENGINE USED IN RETROFITTED M39 SERIES VEHICLES.

The definition of retrofit is: a change in design, construction, or equipment already in operation that can be modified with the latest improvements.

The Marine Corps is converting M39 Series (multifuel) vehicles into M809 series vehicles by using a retrofit kit. The kit consists of the following:

Diesel Engine (Cummins 250)	Hood
Transmission (Spicer Mod No 6453)	Radiator
Steering Gear (Ross)	Surge Tank
Right Front Fender	Exhaust Components
Left Front Fender	Shield
Brush Guard	

Three different models will be retrofitted by the Marine Corps. The models are the M54 cargo, M543 wrecker, and the M52 tractor. This retrofit project will be done by depot maintenance. The total amount of the planned conversions are 2,591 vehicles.

In summary, updating good 5-ton multifuel M39 Series vehicles with current improvements saves the Marine Corps a lot of money.

EXERCISE: Answer the following question and check your answer against that is listed at the end of this study unit.

1. The type of engines used in retrofitted M39 Series vehicles are _____.

Section II. 10-TON M-SERIES TACTICAL TRUCKS

Work Unit 2-6. CHARACTERISTICS

LIST THE TWO PRIMARY PURPOSES OF THE 10-TON M-SERIES TRUCK TRACTOR.

Now that you have been introduced to the 2 1/2-ton and the M-Series 5-ton, you will get to know the big boys, the M123E2 10-ton, truck tractor, 6x6.

This vehicle is capable of operation on all types of roads or highways and off-highway operations over limited rough terrain. Each truck tractor has one driving front axle and two driving rear axles with six driving wheels. The truck tractor is a heavy vehicle, intended primarily for use with a semi-trailer and combat vehicle recovery operations. A winch and fifth wheel are used with semi-trailers equipped with a 3.5-inch king pin. It is mounted on the frame behind the cab. The M123E2 vehicle also contains a diesel engine. A towing pintle, towing shackles, air brakes and electrical connections are located at the rear of the vehicle to provide for towing of other vehicles. The truck cab is the soft type.

You have just read about the basic characteristics of the tractor truck M123E2 and its capabilities.

Fig 2-22. Tractor truck M123E2.

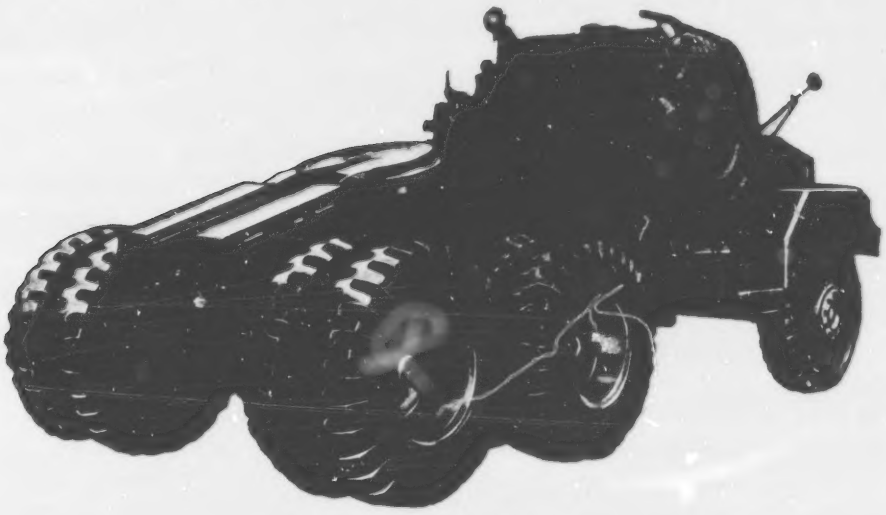


Fig 2-23. Tractor truck M123E2.

EXERCISE: Answer the following question and check your answer against that is listed at the end of this study unit.

1. List the two primary purposes of the 10-ton M-Series truck tractor.

   a. _____

   b. _____

Work Unit 2-7. TRUCK SYSTEMS

NAME THE TYPE OF ENGINE FOUND IN THE M123E2 SERIES VEHICLE.

NAME THE TYPE OF BRAKE SYSTEM USED ON THE 10-TON M-SERIES VEHICLES.

NAME THE COMPONENT THAT ACTUATES THE HYDRAULIC POWER ASSIST STEERING UNIT.

The M123E2 tractor is equipped with a liquid cooled, Cummins 300, V/8, diesel engine. It is rated at 300 brake horsepower at 3,000 rpm. A two-plate dry disk type clutch and the following engine components or accessories are used: fuel injector pump and governor; fan; watercooled air compressor; hydraulic pump; alternator with integral regulator; starter and solenoid; bypass and full flow lubricant oil filters; oil cooler; triple-stage fuel filters; intake manifold heater; dry-type air cleaner, and crank case ventilator.

The transmission and transfer assembly consists of transmission, transfer, and power take-off. The transmission has five forward speeds and one reverse speed. The transfer has two ranges, direct high and underdrive low, to provide ten forward and two reverse speeds. The transfer transmits power to both front and rear axles. The power take-off supplies power to operate the winches. A hand brake drum is mounted to the rear axle output flange of the transmission.

The fuel system consists of two fuel tanks, a fuel pump, a fuel filter, a fuel injector pump, an intake manifold heater, a hand operated fuel primer pump, and an air cleaner. The two 83-gallon fuel tanks are interconnected to provide a capacity of 166 gallons. The air cleaner is of the dry element type and is mounted in the engine compartment.

The liquid-cooled system is pressurized to four pounds per square inch and uses a water solution as a coolant. The cooling system capacity is 49 quarts.

The 24 volt dc electrical system consists of four batteries, a starting system and an alternator.

Four 12-volt storage batteries connected in series parallel supply the 24-volt electrical power to operate the vehicle. The negative terminal is grounded to the vehicle frame. Two batteries are located in a compartment on the right side of the vehicle between the step and cab door. Two additional batteries are located in a box under the right seat in the cab. Front suspension system consists of semi-elliptical springs mounted longitudinally with fixed eye at the rear and shackled at the front. Hydraulic shock absorbers control the action of the front springs. Rear suspension consists of a pair of inverted semi-elliptical springs, mounted longitudinally at the center to a trunnion arrangement attached to the frame. The spring ends are secured to the undersides of the axle housings. Two torque rods with ball sockets at each end retain the turning effort of the rear axle housings.

The front wheels turn by a conventional steering wheel which actuates a hydraulic power assist steering unit. Hydraulic pressure is supplied by an engine driven pump.

All front and rear wheels are equipped with air-operated service brakes. A differential braking arrangement on the rear wheels assists in making tight turns. Slack adjusters provide a quick and easy method of adjusting the brakes to compensate for lining wear. A drum type hand-operated parking brake is mounted at the rear of the transfer and is controlled by a lever in the cab.

The tires used on the vehicle are of 20-ply construction, size 14:00x24 with non-directional, mud and snow type treads.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. Name the type of engine found in the M123E2 Series vehicle.

   _____.

2. Name the type of brake system used on the 10-ton M-Series vehicles.

   _____.

3. What component actuates the hydraulic power assist steering unit?

   _____.

SUMMARY REVIEW

In this second study unit you were introduced to the 5-ton and 10-ton M-Series tactical trucks. You were also acquainted with the model variations. In study unit #3 you will be introduced to the operating instructions of the M-Series heavy tactical trucks.

Answers to Study Unit Exercises

Work Unit 2-1.

1. 78 inches

Work Unit 2-2.

1. turbocharger
2. manually

Work Unit 2-3.

1. 250
2. preheat inducted air during cold weather
3. four

Work Unit 2-4.

1. automatic
2. air

Work Unit 2-5.

1. Cummins 250

Work Unit 2-6.

1. a. Use with semi-trailers
   b. Combat recovery operations

Work Unit 2-7.

1. Cummins 300
2. air
3. steering wheel

STUDY UNIT 3

OPERATING INSTRUCTIONS OF HEAVY TACTICAL TRUCKS

STUDY UNIT OBJECTIVE: UPON SUCCESSFUL COMPLETION OF THIS STUDY UNIT, YOU WILL IDENTIFY THE OPERATING INSTRUCTIONS OF M-SERIES HEAVY TACTICAL TRUCKS.

Work Unit 3-1. BREAK-IN OPERATION

STATE THE MINIMUM DISTANCE IN MILES OF A NEW M-SERIES HEAVY VEHICLE ROAD TEST.

When a new, used, or reconditioned vehicle is first received by the using organization, it is the responsibility of the officer-in-charge to determine whether the vehicle has been properly prepared for service by the supplying organization. A vehicle must be in good condition in order to perform its function.

The deprocessing inspection will normally be completed prior to issue to the using organizations, depending upon the time allocated and personnel available. New vehicles received, should be inspected to insure that the following deprocessing has been completed:

a. All pressure sensitive tape has been removed from

(1) engine exhaust stack opening
(2) oil filter cap
(3) oil dipstick
(4) air cleaner opening
(5) air brake glad hands
(6) crankcase breather
(7) door glass
(8) battery cables
(9) selector levers

b. All black polyethylene removed from

(1) instrument panel
(2) defroster vents
(3) seat backs and cushions
(4) horn button
(5) cargo cover and end curtains

c. Plywood cover removed from windshield assembly

d. Wiper arms, blades, side mirrors, and soft top cab installed

e. Protective covering removed from heater exhaust opening

f. Bows, end curtains, safety straps, and cargo cover installed

g. Tire pressures adjusted

h. All trash from vehicle cab and cargo body removed. Vehicle washed and cleaned

i. All excess quantities of P-19 preservative removed

j. All boxed components and equipment installed in normal stowage position

k. Spare fuel container flushed thoroughly with approved solvents and installed on vehicle

l. Wood block and securing wire removed from clutch pedal

m. Plastic or metal plugs and/or tape removed from air brake exhaust vents

n. Plastic film under battery filter caps removed and discarded

o. Tape removed from intervehicular jumper cables air lined and safety chains

p. Tape and barrier wrap removed from hydraulic piston rod of crane, hoist, or dump track

q. Tape removed from shock absorbers

After performing the deprocessing required, a preventive maintenance check will be performed. This will be covered in the next study unit. The vehicle will be inspected for the required tools, repair parts, publications, and attachments. Vehicular check for damage during loading and unloading of materials being shipped will be conducted.

After the vehicle has had a good preventive maintenance check, it is then ready for break-in. Prior to initiating the break-in services, the operator/crew must be familiar with the vehicle's controls, instruments, and operations. This will be covered in the next work unit. The operator has the opportunity to establish conditions for an optimum service life during that first 100 hours of engine operation or 3,000 miles of vehicle operation.

The operator should accomplish the following:

a. Operate as much as possible at one-half the three-quarters throttle.

b. Avoid operation for long periods at engine idle speeds or at maximum horsepower levels in excess of five minutes.

c. Check oil level at each 300 miles or 10 hours whichever occurs first during break-in service.

d. Avoid improper selection of transmission gear ratios as specified on instruction plate.

e. Do not accelerate or decelerate rapidly.

f. Avoid sudden stops, unless, it is an emergency.

g. Do not force engagement of any operating controls.

h. Avoid overheating the engine and the cooling system.

All vehicles received by the using organization must be road tested to check operation and to determine vehicle condition for all new or reconditioned vehicles, except those driven 50 miles or more in the course of delivery. The road test will be a minimum distance of 50 miles. For used vehicles driven 50 miles or more in the course of delivery, a road test should be of sufficient length to allow for an observation check as to operation and condition of the vehicle. The operator will observe, as frequently as possible, the instruments and gages for any indication of unsatisfactory vehicle performance. Periodic stops will be made at least every 10 miles, to allow the operator to inspect the vehicle for possible coolant, oil, fuel, compressed air, brake fluid, or exhaust leakage. The operator will also check for evidence of overheating in the engine, transmission, wheel hubs, brake drums, axle differentials and transfer assembly. The vehicle must be checked thoroughly for any control difficulty. Any instrument operating in an erratic manner, or having unusual noises and vibrations will be noted.

EXERCISE: Answer the following question and check your response against that listed at the end of this study unit.

1. The minimum distance in miles of a new M-Series heavy vehicle road test is _____.

Work Unit 3-2. CONTROLS AND INSTRUMENTS

STATE THE PURPOSE OF THE HAND THROTTLE CONTROL.

DESCRIBE THE PURPOSE OF THE AIR CLEANER FILTER INDICATOR.

STATE THE REASON FOR THE MANIFOLD HEATER FOUND ON THE MULTIFUEL ENGINE VEHICLES.

STATE THE PURPOSE OF THE TACHOMETER.

STATE THE CHARGE CONDITION OF THE BATTERIES WHEN THE BATTERY-GENERATOR GAGE INDICATES IT IS IN THE YELLOW ZONE.

LIST THE TWO TYPES OF TRUCKS THAT ARE EQUIPPED WITH AIR BRAKE CONTROLS.

You have been introduced to the 2 1/2-, 5-and 10-ton vehicles, and you know how to deprocess and break one in, lets read about the controls and instruments. You, the operator, should become completely familiar with the location and use of all controls and instruments.

Study figures 3-1 and 3-2 as examples of instrument panels found in the newer 5-ton vehicles. Start with the hand control throttle. It is used to set engine speed at any desired rpm for fast idle, warm up, or operation of auxiliary material. When the control knob is out it may be locked in any desired position. Rotating the control knob clockwise or counterclockwise unlocks it, and moving the control knob to the in position causes engine rpm to return to set idling speed.

1 Hand throttle control
2 Fuel pressure gage (preheater)
3 Preheater indicator
4 Preheater switch
5 Battery switch

6 Vehicle lighting switch
7a. Fuel tank selector switch (M815, M817, and M818)
b. Signal light switch (M816 and M819)
8 Fuel level gage
9 Speedometer and odometer (tachograph M818 only)
10 Emergency engine stop control
11 Tachometer
12 Temperature gage
13 Air cleaner filter indicator
14 Main floodlight control switch (M816, M819, and M821)
15 Fording valves control
16 Electric brake lock switch (M816 or M819)
17 Battery-generator indicator
18 Instrument panel lamp
19 Air pressure gage
20 Oil pressure gage
21 High beam indicator lamp
22 Primer pump(preheater)
23 Windshield wiper control
24 Fuel tank selector switch (M816)
25 Ignition switch
26 Electrical receptacle outlet (M816, M819, and M821)

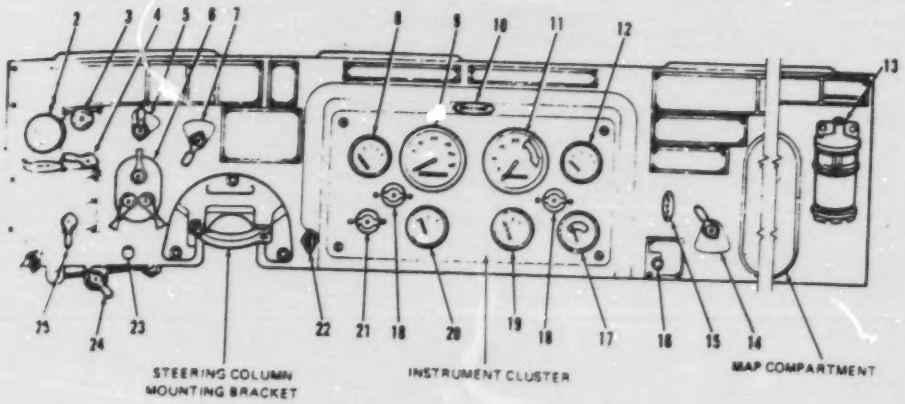


Fig 3-1. Typical instrument panel M-Series.

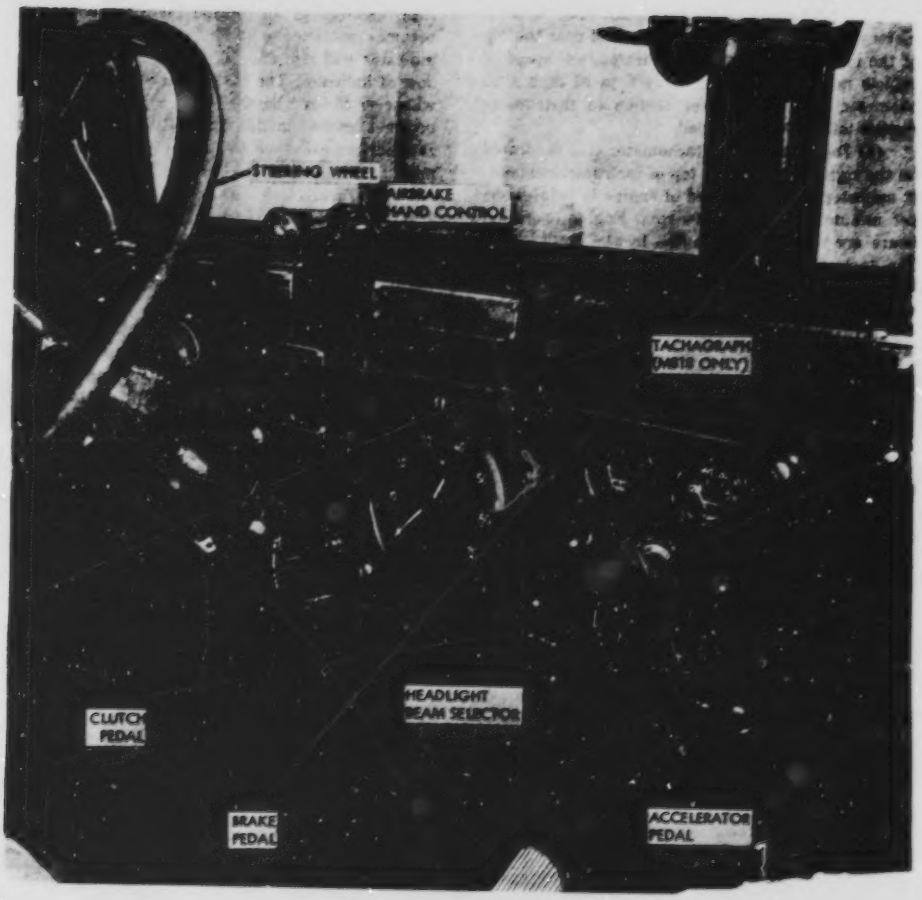


Fig 3-2. Typical controls M809 series.

The preheater switch is a two position toggle switch which may be placed in the ON or OFF position. The preheater indicator lamp will glow when the switch is placed in the ON position and is independent of the battery switch. The preheater's purpose is to preheat the induction air and is used as an aid to engine starting during cold weather operations.

The battery switch is located on the instrument panel. When the switch lever is turned to the ON position, all electrical circuits are energized. In the OFF position, all the electrical circuits are deenergized. On models equipped with dual fuel tanks, you will find a fuel tank selector switch (fig 3-3). This switch is connected electrically to left and right fuel tanks. A fuel level reading may be obtained on the fuel level gage for each fuel tank by positioning fuel tank selector switch to the L or R position.

The fording valve SHUTOFF control is located between the map compartment and instrument panel on all vehicles equipped with a deep water fording kit. The control knob is pulled out to close the crankcase ventiiating system before all fording operations. The control knob should remain in the IN position for all other operations. The emergency engine stop control is located on the dash. The control knob will be pulled out to shut down the engine on multifuel models, but on M809 series and M939 series it is done in emergency situations only.

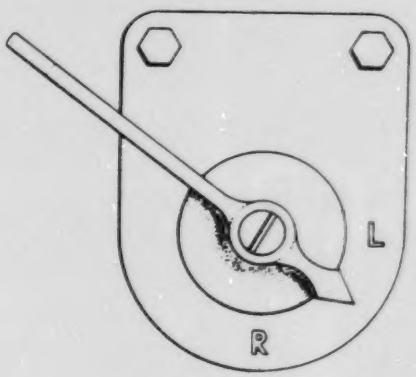


Fig 3-3. Fuel selector valve M809 series.

M809 series, M939 series, and retrofit vehicles are equipped with a preheater primer pump. This pump is manually operated to insert fuel onto the preheater glow plug located in the air horn of the intake manifold during cold weather. It is also used in the prime fuel system after changing the fuel filter element or whenever the fuel injector pump becomes air bound.

The air operated windshield wiper control regulates the speed of the windshield wiper's motors. Turning the control knob counterclockwise will increase wiper motor speed, and turning the control knob clockwise will decrease wiper motor action and stop wiper motors.

There are two types of ignition/starter switches. In the multifuel series, there is a battery ignition switch and this type of switch has to be put in the ON position in order to activate the push button type started. The M809, M939, and Retrofit series have a rotary switch with the three positions of start, run, and off. During starting operations the switch lever is turned to the start position. In this position, the turn will crank the engine. When hand pressure is released, the lever will automatically return to the run position.

The vehicle lighting switch is located on the instrument panel to the left of the steering column. Refer to Figure 3-1, item 6 for operation of vehicle lighting switch.

Instrument panel gages are located in the center of the dash panel. The fuel pressure gage indicates pressure delivered by the hand primer pump during cold weather starting, or whenever it is necessary to purge the fuel system of air. The gage ranges from 0-120 PSI. A reading of 90-120 PSI should be registered and maintained, as near as possible, during cold weather starting. This gage is not equipped on 2 1/2-ton, 5-ton, multifuel or 10-ton vehicles.

The fuel level gage is an electrically operated unit which indicates the level of fuel in fuel tank(s). The gage registers only when the battery switch is in the ON position. The speedometer and odometer indicate both road speed in miles per hour and miles traveled.

The tachometer indicates operating speed of the engine in revolutions per minute, from 0-4,000 rpm. An hour meter is located in the center gage and indicates hours of engine operation and is registered to the nearest 1/10th of an hour. This tachometer is provided to assist the operator in keeping the engine operating speed within the range of maximum efficiency.

The temperature gage registers engine coolant temperature between 120° F and 240°F. Normal operating temperature should be 165°F to 195°F. When operating any M-Series vehicle, the operating temperature should be monitored closely. Engine coolant should never be overheated. The battery-generator gage indicates the state of charge of the batteries. The dial is color coded: red, yellow, green and red in that order. The first red indicates a low charge or over charge. Yellow on the dial indicates low state of battery charge and should be monitored closely. If the dial indicator is in the Green, the batteries are in a normal state of charge. The ignition switch activates the gage when in the ON position. When the vehicle engine is running, the gage indicator should be in the Green at all times. If it is not, then second echelon work is required. The air pressure gage indicates air pressure in air reservoirs and lines of the vehicle compressed air system. Normal operating pressure is 120 PSI with the engine operating. The vehicle should not be moved with a reading of less than 85 PSI on the gage. An air system warning buzzer operates between 0-60 PSI, indicating low air pressure. The vehicle should not be moved in this condition.

The oil pressure gage indicates engine oil pressure when the engine is operating and registers 0-120 PSI. Normal oil pressure, when the engine is idling, is 5-20 PSI. During normal highway or cross-country operations, the gage should register 25 and 70 PSI. If a low reading is registered, stop the engine and check the oil quantity in the engine.

The air cleaner indicator registers the condition of the air filter element. When the filter element becomes restricted to air flow, the red band within the indicator will rise and become visible through the window. The air filter element should be cleaned or replaced if necessary.

Now read on about cab controls.

First the steering wheel is mounted on the steering column directly in front of the operator's seat. The operator is assisted in turning the wheels by a hydraulically operated power steering system on all 5-ton and 10-ton M-Series vehicles. Power assisted steering is available only when the engine is running. The 2 1/2-ton M-Series vehicle employs a conventional steering system with a cam and lever. It is not equipped with a power steering system.

The air brake control is mounted directly below the steering wheel. This control is hand operated and controls the braking action on a towed trailer or semi-trailer. It can be operated independently or in conjunction with the towing vehicle's brakes. Movement of the control handle towards the operator applies the brakes, and movement away from the operator releases the brakes. This control is standard only on wreckers and tractor trucks.

The clutch pedal is located near the toe board to the left steering column. The pedal is depressed by the operator's left foot to disengage the clutch. This permits shifting of the transmission, transfer, power takeoff, and power divider as applicable. A return spring on the clutch pedal linkage and springs inside the clutch assembly causes the clutch to return the fully engaged position whenever the operator's foot is removed from the pedal.

Note: The M939 Series vehicle is not equipped with a clutch because of the automatic transmission.

The brake pedal is located near the toe board to the right of the steering column. The service brakes are applied whenever the pedal is depressed by the operator's right foot. A return spring on the brake linkage and springs attached to the brake shoes inside the brake drum assemblies cause the brake shoes to return to the fully disengaged position, whenever the operator's foot is removed from the pedal.

The accelerator pedal is mounted on the cab floor to the right of the brake pedal. It is connected through linkage to the engine fuel injector pump and is operated by the operator's right foot. Engine speed is increased above idling speed by depressing the accelerator pedal downward. A spring will return the accelerator outward when the pedal is released. The engine speed will return to its set idling speed when the accelerator pedal is released. The transmission selector lever is located to the operator's right and is positioned to allow the operator to manually select gear speed ratios within the transmission. In the new M939 Series vehicle, the transmission selector lever is mounted on the dash.

The transfer selector (Fig 3-4) is located to the rear of the transmission selector lever and is manually operated. The selector lever is pulled up to shift the transfer into high range, and pushed down to shift into low range. The neutral position is midway between high and low range.

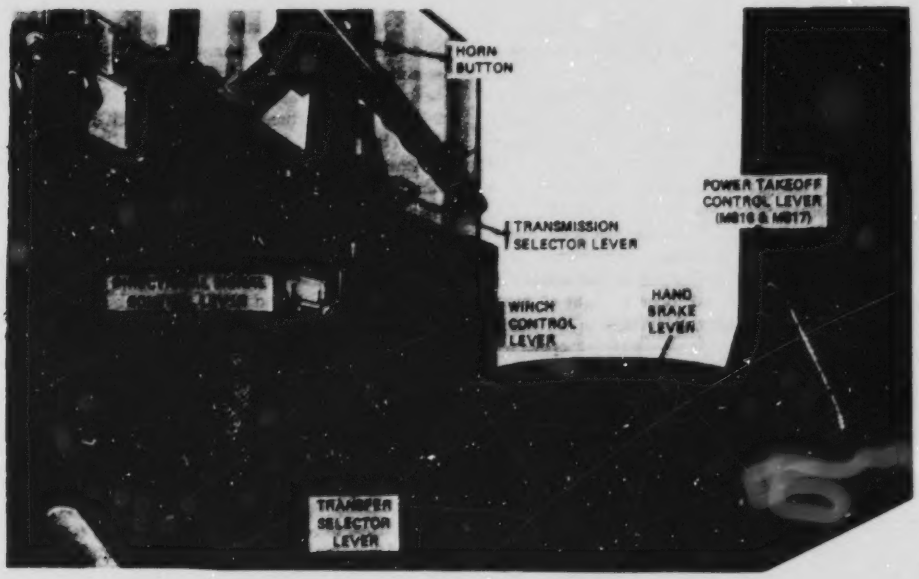


Fig 3-4. Cab controls M809 series.

The handbrake lever is located on the floor of the cab to the left of the operator's seat and is manually operated by the operator's left hand. The handbrake lever is pulled up to apply the handbrake mounted at the rear of the transfer assembly. The handbrake is released by pushing the handbrake lever down. A knurled knob on top of the lever may be rotated clockwise to increase braking action. To decrease braking action (to prevent dragging of braking shoes) turn knurled knob counterclockwise.

You have just become familiar with most of the instruments and controls found in the M-Series, heavy tactical vehicles. Although they may vary slightly between models, they serve the same purposes.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. What is the purpose of the hand throttle control?

_____

2. Describe the purpose of the air cleaner filter indicator.

_____

3. State the reason for the use of the manifold heater found on multifuel engine vehicles. _____

4. State the purpose of the tachometer.

_____

5. State the charge condition of the batteries when the battery-generator gage is in the yellow zone. _____

6. List the two types of trucks that are equipped with air brake controls.

(a) _____

(b) _____

SUMMARY REVIEW

In summation, you have learned the break-in operation, controls, and instruments found in your M-series heavy tactical vehicles. In the next study unit, you will become acquainted with preventive maintenance services.

Answers to Study Unit #3 Exercises

Work Unit 3-1.

1. 50 miles

Work Unit 3-2.

1. To set engine speed at any rpm
2. To indicate condition of air filter element
3. To preheat inducted air during cold weather
4. To indicate operating speed of engine
5. Batteries in low state of charge
6. Wrecker and tractor truck

STUDY UNIT 4

PREVENTIVE MAINTENANCE SERVICES

STUDY UNIT OBJECTIVE: UPON SUCCESSFUL COMPLETION OF THIS STUDY UNIT, YOU WILL IDENTIFY THE PURPOSE, THE RECORDS USED, AND THE OPERATOR'S ROLE IN PREVENTIVE AND CORRECTIVE MAINTENANCE.

Now, that you can identify most of the heavy trucks; the purposes of their controls and instruments, and you know how to break in the truck, you should also know the operator's role in the preventive maintenance services system.

Work Unit 4-1. PREVENTIVE MAINTENANCE

STATE THE PRIMARY REASON FOR PREVENTIVE MAINTENANCE.

NAME TWO OFFICIALS THAT ARE PERSONALLY RESPONSIBLE FOR ASSIGNED MATERIALS.

Preventive maintenance is the systematic care, inspection, and servicing of equipment necessary to maintain a vehicle in good condition, to prevent breakdowns and ensure maximum operational readiness. The operator's preventive maintenance is accomplished by the equipment operator. The operator's role in the performance of preventive maintenance service is to:

a. Perform a daily service check each day the equipment is operated.

b. Assist the organizational maintenance mechanics in the performance of any other scheduled periodic services specified by pertinent technical manuals.

c. Assist the organizational maintenance mechanics in the lubrication of the equipment in accordance with the pertinent lubrication order.

The operators and crew chiefs are personally responsible for assigned materials. Squad, section, and platoon leaders are charged with supervisory responsibility for material pertaining to their unit. Unit and organizational commanders are required to ensure that material issued or assigned to their commands is properly maintained in a serviceable condition, and that it is properly cared for and used.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. State the primary reason for preventive maintenance.

_____

2. Name two officials that are personally responsible for assigned material.

_____

_____

Work Unit 4-2. PREVENTIVE MAINTENANCE FORMS

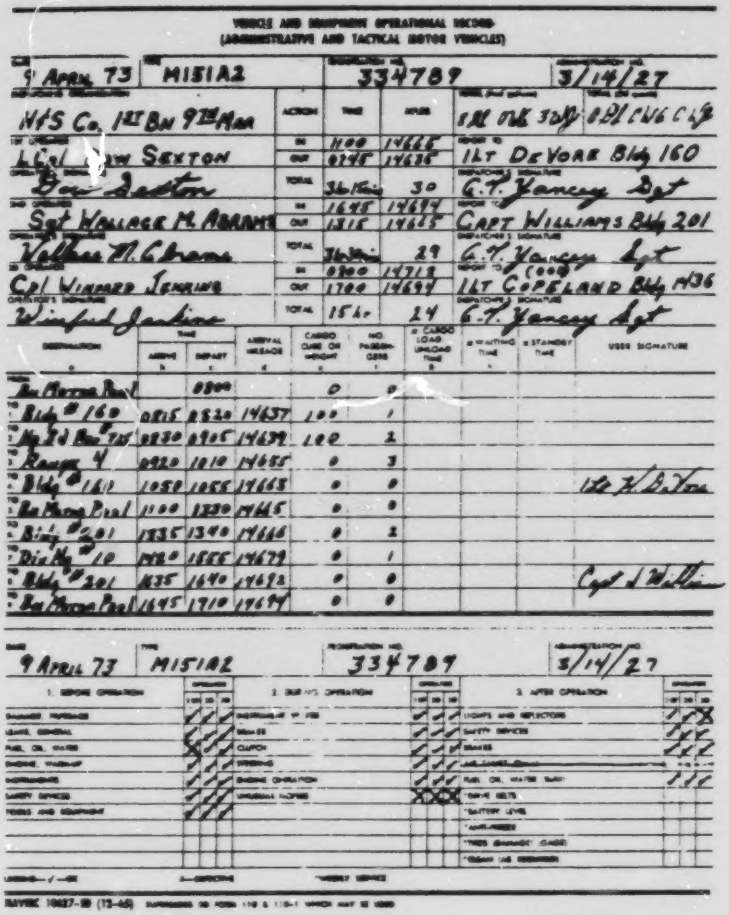
NAME THE NAVMC FORM USED TO RECORD DAILY DEFICIENCIES AFTER HEAVY VEHICLE USE.

STATE THE NAME OF THE LOCALLY PRODUCED FORM USED BY THE MARINE CORPS IN THE PREVENTIVE MAINTENANCE SYSTEM OF HEAVY VEHICLES.

LIST THE THREE MAIN PARTS OF THE DAILY INSPECTION FORM.

GIVEN A LIST OF OPERATIONAL SERVICES AND A LIST OF OPERATIONAL CHECKS, MATCH EACH OPERATIONAL SERVICE WITH THE APPROPRIATE OPERATIONAL CHECK.

The purpose of preventive maintenance by the driver is to ensure maximum operational readiness. It is necessary to systematically inspect the vehicle at intervals each day that it is used, so that defects may be discovered and corrected before they result in serious damage or failure to the vehicle. Certain scheduled maintenance services will be performed at these designated intervals. Any deficiencies discovered that cannot be corrected by the operator will be reported to the supervisor who will take appropriate action. The form used is the NAVMC 10627 SD (Trip Ticket). With this NAVMC 10627 SD (fig 4-1), each vehicle will be inspected each day that it is operated. This service is divided into three parts, as indicated below.



VEHICLE AND EQUIPMENT OPERATIONAL RECORD
(ADMINISTRATIVE AND TACTICAL MOTOR VEHICLES)

9 April 73 | M151A2 | 334789 | 3/14/27

M/S Co, 1st Bn 9th Mar | IN 1100 14666 | 5 Mi ONE 32½ | 81 CYL CAR
1/Lt John Sexton | OUT 0745 14636 | 1LT DeVore Bldg 160
Jon Sexton | TOTAL 36½ Hrs 30 | G.F. Yancey Sgt
Sgt Wallace M. Abrams | IN 1645 14694 | Capt Williams Bldg 201
Wallace M. Abrams | OUT 1815 14665 | G.F. Yancey Sgt
Col Winfred Jenkins | TOTAL 25½ Hrs 29 | IN 0900 14718 | G.F. Yancey Sgt
Winfred Jenkins | OUT 1700 14694 | 1LT Copeland Bldg M36
TOTAL 15½ Hrs 24

DESTINATION	TIME: DEPART	TIME: ARRIVE	ARRIVAL MILEAGE	CARGO CUBE OR WEIGHT	NO. PASSENGERS	CARGO LOAD/UNLOAD TIME	WAITING TIME	STANDBY TIME	USER SIGNATURE
Bn Motor Pool	0900			0	0				
Bldg # 160	0815	0820	14657	100	1				
Hq 3d Bn 9th	0830	0905	14679	100	2				
Range 4	0920	1010	14685	0	3				
Bldg # 160	1050	1055	14665	0	0				1Lt J. DeVore
Bn Motor Pool	1100	1330	14685	0	0				
Bldg # 201	1335	1340	14686	0	2				
Div Hq # 10	1520	1555	14679	0	1				
Bldg # 201	1635	1640	14692	0	0				Capt J. Williams
Bn Motor Pool	1645	1710	14694	0	0				

9 April 73 | M151A2 | 334789 | 3/14/27

1. BEFORE OPERATION | 2. DURING OPERATION | 3. AFTER OPERATION

NAVMC 10627-SD (73-68)

Fig 4-1. Trip ticket NAVMC 10627 SD.

Before-operation services

This is a brief service to ascertain that the vehicle is ready for operation; it is mainly a check to see if conditions affecting the vehicle's readiness have changed since the last after-operation service check.

BEST COPY AVAILABLE

During-operation service

This service consists of detecting unsatisfactory performance while driving. The driver or crew should be alert for any unusual noises or odors, abnormal instrument readings, steering irregularities, or any other indications of malfunction of any part of the vehicle. Every time the brakes are applied the gears shifted, or the vehicle turned, the driver should instinctively consider it a test and note any unusual or unsatisfactory performance.

After-operation services

This is the basic daily service for tactical vehicles. It consists of correcting, in so far as possible, any operating deficiencies. Thus, the vehicle is prepared to operate upon a moment's notice.

Now see what the NAVMC checklist consists of and what you should look for. First category: before-operation services.

Damage, Pilferage	Visually check vehicle cab doors, and glass, body paulin, bumpers, fenders, springs, shock absorbers, hood, mirror windshield, wiper blades and running gear for damage.
Leaks, General	Check under vehicle for any indication of coolant, engine oil, fuel gear oil, or brake fluid leaks.
Fuel, oil, water	Drain fuel filter water separator, check for contamination and water. Check engine oil for contamination and level. Chec coolant level, hoses, clamps, radiator frame for damage and leaks.
Engine warm up	Start engine. Check idle speed for low or high rpm. Refer to TM 9- for specifications; check instrument readings. Accelerate engine slowly between 800 rpm to 1,000 rpm for 5 min. or until temperature reaches approximately 140°F. Before engaging the load, listen for any unusual noises. Check instrument readings constantly.
Instruments	Check operation of the oil pressure gage, (idling 15 psi to 20 psi) battery-generator indicator (Green), Fuel gage (Full), Tachometer (RPM), coolant temperature gage (140 F), air pressure gage (+120 PSI). If any gages do not indicate reading as above, stop engine and notify supervisory personnel.
Saftey devices	Check and adjust mirrors to driver's best vision. Check handbrake and adjust, if needed. Check lights, reflectors, wipers, and horn. Check service brake and air pressure warning buzzer.
Tools and Equipment	Check and service vehicle tools and equipment as required, for basic issue items. Refer to the required TM.

This concludes the before-operation services. Now go on to the during-operations column.

Instrument Brakes	Ensure that the handbrake holds the vehicle on an incline; adjust if required.
Brakes	Check free travel of brake. As a minimum and maximum, free travel is needed. Where conditions permit, move vehicle and check braking effect, feel, side pull, noise, chatter and air-hydraulic operation.

Clutch	Check clutch for a minimum and maximum free travel. Check for drag, noise, chatter, grab, slippage and clashing of gears.
Steering	Check for unusual free play, binding, wander, or shimmy of the steering system.
Engine operation	Listen for any unusual noises during acceleration and notice engine for response and performance.
Unusual noises	Always be alert for unusual noises while driving the vehicle and try to isolate the cause.

Now that you have accomplished your unit's mission, you must perform an after-operations service check. This includes the following:

Lights and Reflections	Lights are still working and reflectors are not damaged or cracked.
Safety Devices	Ensure that mirrors are clean, and not cracked or broken. Ensure that the handbrake is adjusted, the horn operates, and the warning buzzer works.
Brakes	Ensure that the service brakes are effective and not pulling or noisy. Check to ensure that air-hydraulic operation is properly working.
Air Tanks (drained)	After securing the vehicle, drain the air tank. This prevents buildup of water and condensation that could damage and affect the brake system.
Fuel, Oil, Water (refill)	Fuel, oil, and water must be replenished to their required levels. This is to ensure that the vehicle is ready to operate at a moment's notice.

The remaining items on the after-operation check list are only required weekly, unless severe usage or unusual conditions prevail.

The legend for the trip ticket is as follows:

- Okay
- Defective
- Weekly service

If any defects are found by the operator, an explanation is written in the remarks column on the opposite side of the trip ticket (NAVMC 10627 SD). The operator then notifies his/her supervisor of the corrective maintenance needed.

In addition to daily preventive maintenance, every motor transport unit in the Marine Corps is required to have a weekly preventive maintenance program. The form, that is used as a guide, is a locally produced weekly preventive maintenance form. Take a moment and study figure 4-2 and 4-3. These are two examples of locally produced weekly preventive maintenance forms currently in use. These weekly preventive maintenance sheets are issued to the driver after completion of the weekly PM sheets, the vehicle must be inspected by the section leader or supervisor. If discrepancies are found that are out of the driver's echelon of maintenance to perform, the vehicle is referred to the organizational maintenance shop where the items requiring attention are adjusted or repaired.

You have just studied the two forms used in the preventive maintenance program. If a unit performs effective preventive maintenance, the readiness of that unit will also be effective. In your next work unit, you will be introduced to corrective maintenance items that you are authorized to perform.

WEEKLY PREVENTIVE MAINTENANCE

DRIVER _____

USMC NO. _____ DATE _____ MAKE _____ MILEAGE _____

DRIVER MAINTENANCE

	OK	UNSAT		OK	UNSAT
1. FUEL			26. OIL LIGHT		
2. OIL			27. GAS GAUGE		
3. WATER (ANTI FREEZE)			28. HORN		
4. RADIATOR AND HOSES			29. WIPERS		
5. FAN BELTS			30. AMMETER GAUGE		
6. BATTERY POST AND CELLS			31. STEERING		
7. BATTERY BOX			32. HEADLIGHTS		
8. TIRE PRESSURE			33. BRAKES (PARKING)		
9. TIRE CONDITION			34. BRAKES (SERVICE)		
0. VALVE CAPS			35. BODY		
1. AIR BREATHER			36. HYDRAULIC LIFT GATE		
2. TRANSMISSION FLUID			37. LUBE		
3. CLUTCH			38. GREASE FITTING		
4. CLEAN INTERIOR			39. OIL CAN MAINTENANCE		
5. CLEAN EXTERIOR			40. BRAKE FLUID		
6. PAINT			41. P. T. O. FLUID		
7. MIRRORS			42. POWER STEERING FLUID		
8. TEMP GAUGE			43. COUPLING (WATER BUFFALO)		
9. FILTER			44. AIR CONDITIONER		
0. CLEAN ENGINE			45. REAR DIFFERENTIAL		
1. WINDOWS			46. NUTS & BOLTS TIGHTEN		
2. TAIL LIGHT			47. SPARE TIRE MOUNTED		
3. TURN SIGNALS			48. SPARE TIRE		
4. BRAKE LIGHT			49. LEAKS		
5. EMERGENCY LIGHT					

ITEMS REQUIRING ATTENTION _____

SECTION LEADERS SIGNATURE

_____

DRIVERS SIGNATURE

_____

OPERATOR'S MAINTENANCE (WEEKLY)

MCDEC 4730-7 (4-71) PREVIOUS EDITIONS

Use both sides for motor vehicles; reverse side only for trailers.

OPERATOR'S NAME (Last, First, M.I.)	VEHICLE/TRAILER NO.	TYPE	DATE

OPERATOR: Inspect items below, service as required and check (✓) when action completed. Place (X) under column "R" if shop work is required.

CODE

CL -- Clean.
O -- Oil, add or lubricate as required.
T -- Tightness or proper fit.
C -- Condition (check mark indicated "SATISFACTORY" or defects noted.
R -- Shoe.

	ITEM		CL	O	T	C	R	REMARKS
DRIVER COMPARTMENT	DD FORM 91 NAME PLATE							
	MIRRORS							
	SAFETY BELTS SEATS							
	INSTRUMENTS ELECT. WIRING							
	WINDSHIELD WIPERS							
	HORN							
	AIR WARNING BUZZER							
	CLUTCH (free play)							
	STEERING SYSTEM (free play)							
	CANVAS TOP							
	TOOLS & EQUIPMENT							
	LIGHTS	DASH						
		INTERIOR						
	BRAKES	SERVICE (free play)						
		EMERGENCY DRUM						
ENGINE	RADIATOR							
	WATER/ANTI-FREEZE (level)							
	ELECT. WIRING							
	AIR CLEANER FILTER							
	LINKAGE	CARBURETOR						
		TRANSMISSION TRANSFER						
	BATTERY	COMPARTMENT						
		POST, CLAMPS & CABLES						
		WATER LEVEL						
	BELTS	FAN/GENERATOR						
		POWER-STEERING/ COMPRESSOR						
	LEAKS	ENGINE FILTER						
		LINES/HOSES						
		POWER-STEERING COMPRESSOR FILTER						
		ALCOHOL BOTTLE						

OVER

Fig 4-3. Locally produced weekly PM form (sample 2).

	ITEMS			CL	O	T	C	R	REMARKS
CHASIS & SUSPENSION	GLASS								
	PAINT & MARKINGS								
	BODY & BUMPERS								
	SOE RACKS SEATS								
	TARP WIND BREAKER(S)								
	PINTLE HOOK								
	LUNETTE SAFETY CHAINS								
	ELECTRICAL WIRING								
	SPRINGS SHOCKS SHACKLES								
	DRIVE SHAFT								
	BREATHER VALVES								
	LATCHES HINGES/ SPRINGS	DOORS							
		HOOD TRUNK							
	LIGHTS	TAIL STOP FLASHERS							
		BLACK-OUT DRIVE							
		CLEARANCE REFLECTORS							
	TIRE (S)	SPARE	(PRESSURE rotate, match wear needed)						
		GROUND							
		VALVE CAPS HUB CAPS							
	WHEEL (S)	SEALS							
		HUB ADJUSTMENT							
		LEG CASTOR DOLLY							
		FIFTH KING PIN							
		LUGS LUG NUTS							
	LEAKS	EXHAUST SYSTEM							
		BRAKE SYSTEM							
		LINES HOSES							
		TRANSMISSION TRANSF. CASE DIFFERENTIAL							
	TANK (S)	GAS	(DRAIN WATER)						
		FUEL/OIL							
		AIR							
		WATER							
		STRAINER/FILTERS							
		COVER ASSEMBLY							
		FACETS VALVES PIPES ELBOWS							

OPERATOR'S SIGNATURE | SECTION LEADER'S SIGNATURE

*CDEC 4730-7 (4-71) PREVIOUS EDITION

BACK

Fig 4-3. Locally produced weekly PM form (sample 2)--Continued.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. Name the NAVMC Form used to record daily deficiencies after heavy vehicle use.

   _____

2. The name of the locally produced form used by the Marine Corps in the preventive maintenance system of heavy vehicles is

   _____

3. List the three main parts of the daily inspection form.

   (a) _____

   (b) _____

   (c) _____

Matching: Column 1 (items 4-6) lists operational services. Column 2 (a, b, and c) lists operational checks. Match each operational service in column 1 with the appropriate operational check in column 2. Place your answers in the spaces provided.

Column 1 Services	Column 2 Check List
___ 1. Before operation	a. Clean
	b. Steering
___ 2. During operation	c. Engine warm-up
___ 3. After operation	

Work Unit 4-3. CORRECTIVE MAINTENANCE

LIST THREE FUNCTIONS OF CORRECTIVE MAINTENANCE THAT VEHICLE OPERATORS ARE AUTHORIZED TO PERFORM.

NAME THE TYPE OF WATER PREFERRED WHEN REPLENSIHING BATTERIES TO THE CORRECT LEVEL.

This work unit covers the corrective maintenance instructions of those items within the scope of the operator. The operator, performing corrective maintenance, is authorized to do minor adjustments, maintenance, and removal and installation. The following procedures are provided to assist you in the efficient operation of the vehicle.

First, read about engine services. The hood must be unlatched, raised, and secured in the opened position (fig 4-4) before operation and after operation checks can be accomplished. After engine service has been completed, release the hood, lower to the closed position, and latch it.

Fig 4-4. Hood secured open position.

The engine crankcase oil level should never be low (L) when operating the engine or above the (H) high level mark (fig 4-5). Withdraw the dipstick slowly to prevent a false reading.

Fig 4-5. Engine oil dipstick.

Fig 4-6. Engine oil filler cap.

For that specific engine and climate, Do not overfill. Replace oil filler cap, tighten, and wipe away spilled oil. If engine oil level is low, remove the oil filler cap (fig 4-6) and add engine oil as prescribed by the lubrication order.

When you check the coolant level, be extremely careful when you remove the surge tank filler cap if the temperature gage reads above 195° F. Do not add coolant to the cooling system when the engine is hot unless the engine is running, then add coolant slowly. Remove the coolant surge filler cap (fig 4-7) and visually check coolant level. Before operation, the surge tank should be half full of coolant. After operation, the surge tank will be slightly above half full.

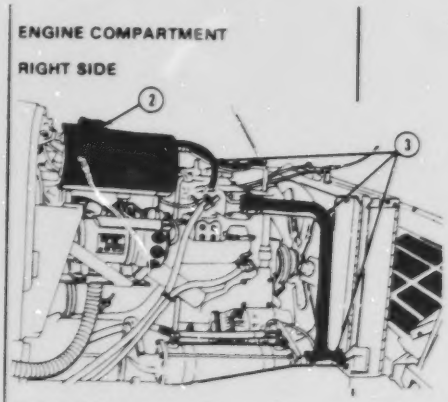

ENGINE COMPARTMENT
RIGHT SIDE
2
3
SURGE TANK
a. Check coolant level in surge tank (2). Tank should be at a minimum 3/4 full before operation. Fill if necessary.
b. Check all hoses (3) for deterioration and or leakage. Tighten loose, leaking hose connections.

Fig 4-7. Coolant surge tank (Cummins).

The hydraulic power steering reservoir is mounted on the left side of the engine near the radiator. (See fig 4-8.)

Fig 4-8. Hydraulic power steering reservoir (Cummins) M809-M939 series.

The hydraulic oil level may be checked visually through the sight glass on the front of the reservoir. Before operation, the hydraulic oil should be visible slightly above the bottom of the sight glass. After operation, the oil level will be slightly higher, but the oil level should still be visible through the sight glass. If the hydraulic oil level is low, remove filler cap and add oil as prescribed by lubrication order, and wipe away any spilled oil.

The combination fuel filter/water separator (fig 4-9) is located under the front fender on all M-Series vehicles and requires daily maintenance, normally before operation. There are two petcocks on vehicles equipped with Cummins engines which must be opened for this service and closed after service. On vehicles equipped with multifuel engine, one petcock is used.

Fig 4-10. Fuel filter/water separator.

Open the petcock located near the top of the fuel filter/water separator on the fuel inlet line. Open the petcock at the bottom of the fuel filter/water separator and allow approximately one pint of liquid to drain into a suitable container.

If large amounts of water and/or impurities are noticed, it will be necessary to allow the fuel to drain until the fuel is clean.

If fuel tank(s) are found to be contaminated, complete draining will be necessary. The draining should be coordinated with organizational maintenance personnel.

After the required service has been completed, close the petcock at the fuel inlet line and the petcock at the bottom of the fuel filter/water separator.

It is necessary to prime the fuel system whenever the fuel filter/water separator element is replaced and/or after a complete draining operation. The hand primer pump is used to prime the fuel system by purging the air from the system.

Open the air purge petcock at the intake manifold. The petcock is a two-way valve. When closed, fuel is directed to the fuel discharge nozzle in the intake manifold. (See fig 4-11.)

When opened, it allows fuel or air to be directed to the atmosphere, whenever the hand primer is actuated.

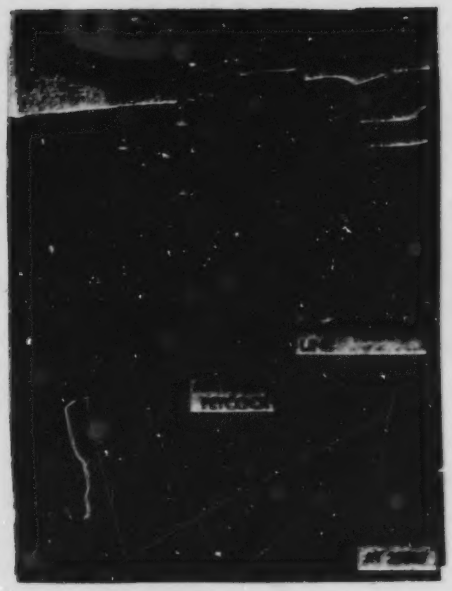


Fig 4-11. Air purge petcock.

Ensure that both petcocks at the fuel filter/water separator are closed.

Place a two gallon container under the air purge petcock. Operate the hand primer pump, and discharge the fuel from the fuel injection pump reservoir. Continue pumping until the fuel flow stops, all air is expelled, and fuel begins to flow again. In approximately 90 seconds, stop the hand primer pumping operation and close the air purge petcock.

Start engine and check for any leaks in the fuel system. To purge air out of the fuel system of a multifuel engine equipped M-Series vehicle, contact organizational maintenance personnel.

Air cleaner service is required whenever the red band is visible in the window of the air cleaner restriction gage located on the instrument panel. Whenever the red band is visible, notify organizational maintenance personnel.

> Warning: Do not operate engine without an air cleaner element except in the case of extreme emergency. In an emergency situation, the air cleaner filter element may be removed and cleaned with compressed air (See fig 4-12). Direct compressed air from the inside the element toward the outer surface of element. Dirt may also be removed by tapping the sides of the element with hands to loosen dirt until it falls off. Do not strike ends of element, or damage to element may result.

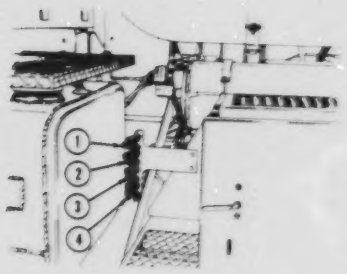
Fig 4-12. Air-cleaner element service.

After cleaning the element, start the engine and release the red band by pressing the bottom of the air cleaner restriction gage. If red band does not disappear, report condition to organizational maintenance personnel.

On all M-Series trucks there are two compressed air reservoirs located under the operator's cab along the left frame rail. On M809 and M939 series trucks, a petcock is located at a cutout on the edge of the running board. (See fig 4-13.)

On multifuel engine equipped vehicles, the petcock is located on the tank itself.

AIR RESERVOIR DRAINCOCKS



(1) Primary airbrake system air reservoir
(2) Secondary airbrake system air reservoir
(3) Airbrake system wet tank reservoir
(4) Spring brake air reservoir

Fig 4-13. Air reservoir drain valve (M809-M939).

The air drain valve should be opened after each day of operation during the after operation service. Open the drain petcock and allow all moisture to escape, then close drain petcock securely.

The operator is also authorized to install and remove cab tops, side racks, troops seats bows, end curtains, and cargo body paulin.

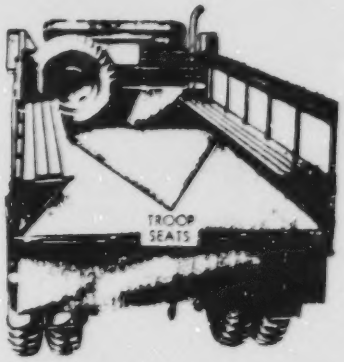


Fig 4-14. Troop seat in lowered position.

Fig 4-15. Cargo body with paulin installed.

Fig 4-16. Cargo body with paulin rolled up on sides.

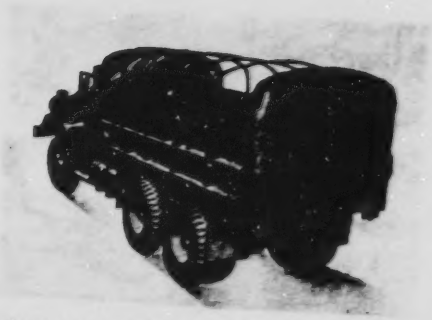


Fig 4-17. Cargo body with bows and end curtain installed.

Figures 4-14 through fig 4-17 illustrate different cargo body variations used, depending on the cargo commitment and mission.

Tires should be checked for proper inflation pressures before operation and after operation. Unserviceable tires found during these services should be replaced. Always stop the vehicle whenever a tire becomes unserviceable, do not drive on deflated tire(s). The tools required to remove and replace the wheel and tire assembly are located in the stowage compartment above the left running board.

Fig 4-18 illustrates the removal of wheel stud nuts. Figure 1-19 illustrates hydraulic jack operation and position, and figure 4-20 illustrates where the spare tire and wheel are located and mounted.

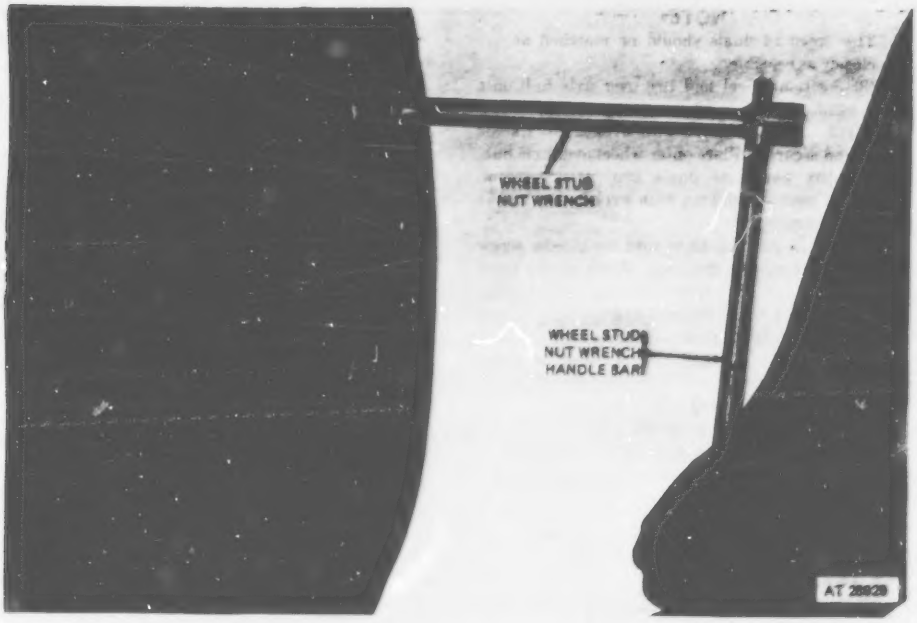


Fig 4-18. Removal of wheel stud nuts.

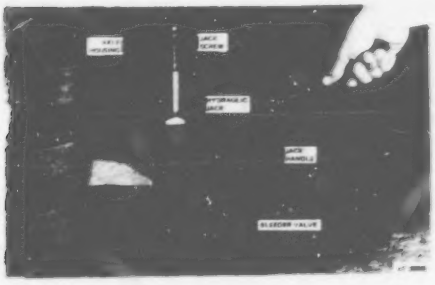


Fig 4-19. Hydraulic jack operation.

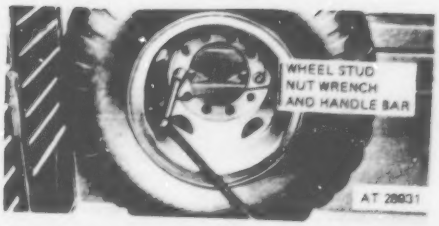
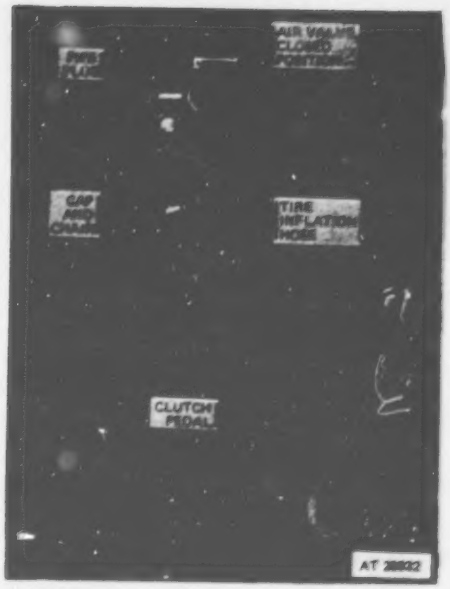


Fig 4-20. Spare tire and wheel.

Tires require a pressure check normally before operation. Inflation pressure is one of the most important elements of tire care.

Check and adjust tire pressure when the tires are cold. It is normal for the tire pressure to rise during operation. Never reduce the pressure of warm tires. A tire inflation gage and hose assembly are provided with each vehicle to gage and inflate the tires. Reinflate tires that have been deflated for mud, sand, and snow operations, after the operation has been completed. Figure 4-21 illustrates where tire inflation hose is connected on the M809 and M939 series vehicles. On multifuel equipped vehicles, the air valve is located under the dash compartment on the passenger side. Figure 4-22 illustrates how to inflate a tire.



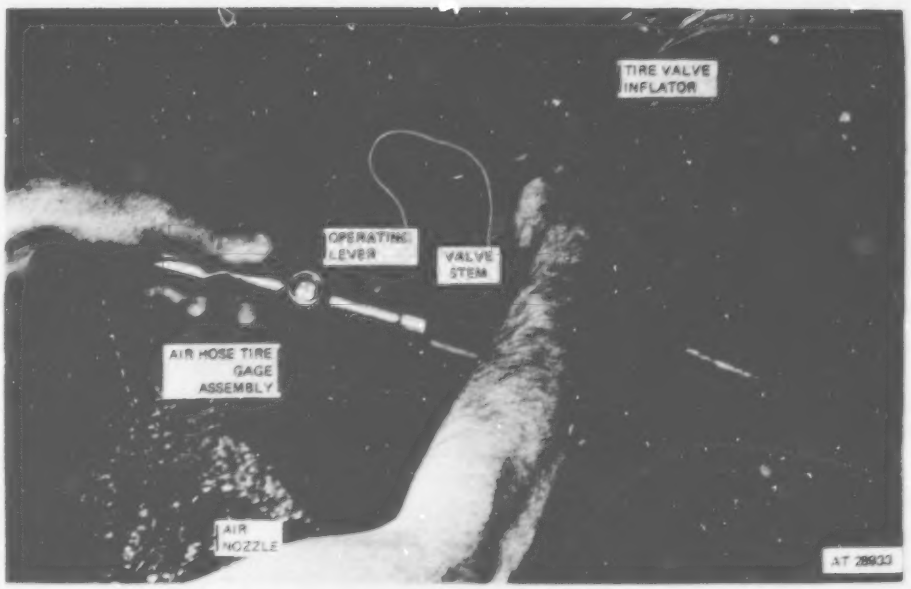


Fig 1-59. Inflating tire.

Some heavy vehicles are equipped with a winch. The winches on the 2 1/2-ton M39 series, M54 series multifuel, M809 series, and re rofit vehicle are driven by a power takeoff unit and driveshaft. A shear pin is used to protect the winch, cable, and operator from overload damage which could cause injury. The front winch drive is through a shear pin which connects the universal joint yoke and the winch drive shaft (fig 4-13). The shear pin is designed to break whenever the winch is overloaded. The winch shear pin is constructed of aluminum and is retained with cotter pins. Never substitute rivets, pins, belts, or nails for the supplied shear pin.

Fig 4-23. Front winch shear pin.

One of the key factors in preventive and corrective maintenance service is lubrication. Each vehicle has a lubrication order included, when issued to an operational unit. The lubrication order prescribes cleaning and lubrication procedures as to locations, intervals, and proper materials for the vehicles. The lubrication order is self-explanatory and is used as a guide when lubricating your vehicle.

The purpose of lubrication is to reduce friction and prevent rapid wear between moving parts. Always use the proper grade of lubricant and when lubricating grease fittings, always wipe foreign matter and dirt away so it will not be forced into the moving parts.

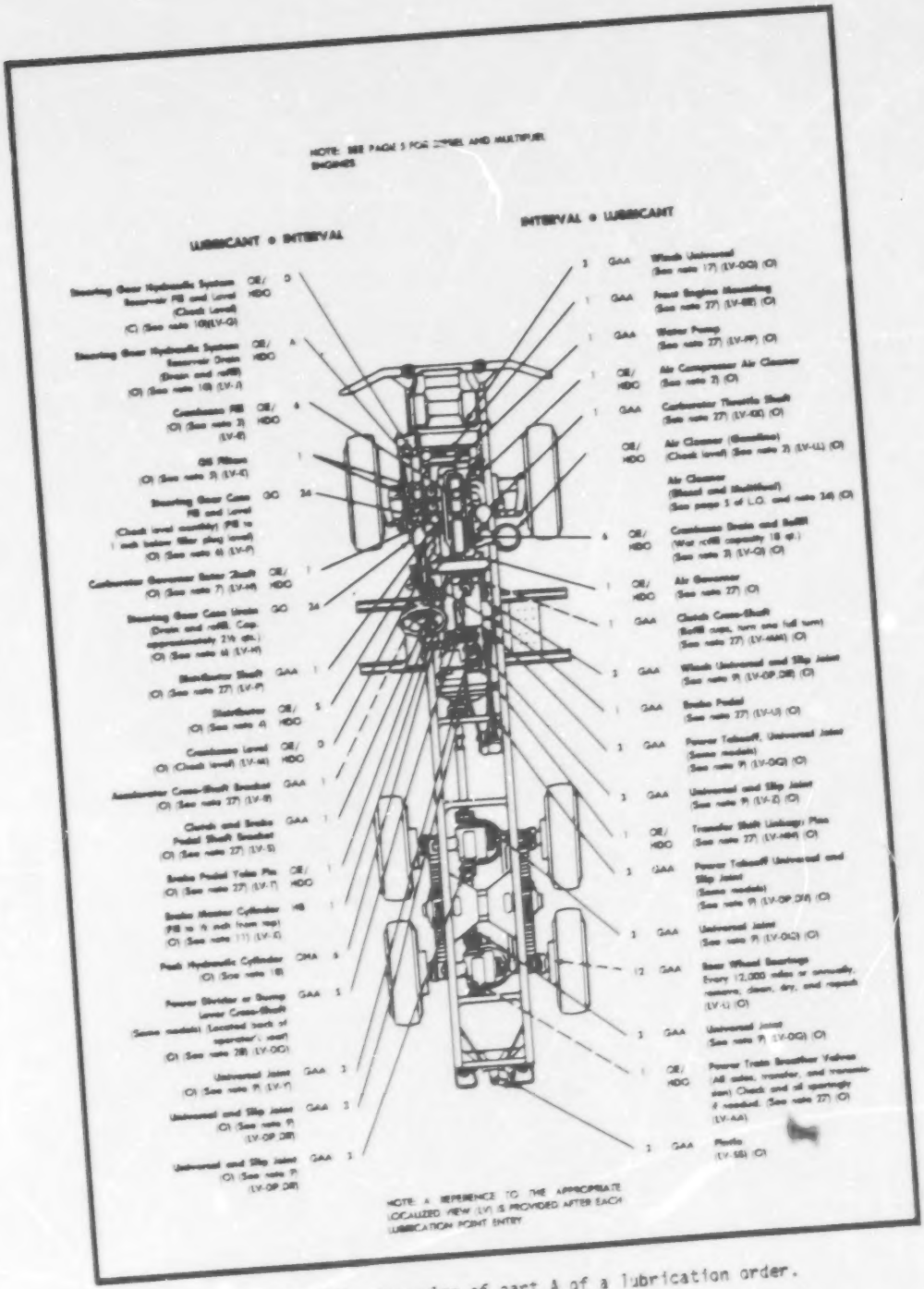

LUBRICANT ● INTERVAL
INTERVAL ● LUBRICANT
Steering Gear Hydraulic System Reservoir Fill and Level Check Level (C) (See note 10)(LV-G)
OE/ HDO
D
Steering Gear Hydraulic System Reservoir Drain (Drain and refill) (C) (See note 10) (LV-J)
OE/ HDO
A
Condenser Fill (C) (See note 3) (LV-E)
OE/ HDO
A
Oil Filters (C) (See note 9) (LV-C)
1
Steering Gear Case Fill and Level (Check level monthly) Fill to hole bottom filler plug level) (C) (See note 6) (LV-F)
GO
24
Condenser Governor Sector Shaft (C) (See note 7) (LV-M)
OE/ HDO
1
Steering Gear Case Intake Drain and refill. Cap approximately 2½ qts.) (C) (See note 6) (LV-H)
GO
24
Distributor Shaft (C) (See note 27) (LV-P)
GAA
1
Distributor (C) (See note 4)
OE/ HDO
S
Condenser Level (C) (Check level) (LV-M)
OE/ HDO
D
Accelerator Cross-Shaft Bracket (C) (See note 27) (LV-R)
GAA
1
Clutch and Brake Pedal Shaft Bracket (C) (See note 27) (LV-S)
GAA
1
Brake Pedal Yoke Pin (C) (See note 27) (LV-T)
OE/ HDO
1
Brake Booster Cylinder Fill to ½ inch from top) (C) (See note 11) (LV-I)
HB
1
Push Hydraulic Cylinder (C) (See note 18)
DMA
S
Power Booster or Dump Lever Cross-Shaft (Some models) (Located back of operator's seat) (C) (See note 28) (LV-OO)
GAA
S
Universal Joint (C) (See note 9) (LV-Y)
GAA
2
Universal and Slip Joint (C) (See note 9) (LV-OP 28)
GAA
2
Universal and Slip Joint (C) (See note 9) (LV-OP 28)
GAA
2
3 GAA Wheels Universal (See note 17) (LV-OQ) (C)
1 GAA Power Steering Mounting (See note 27) (LV-BB) (C)
1 GAA Water Pump (See note 27) (LV-PP) (C)
1 OE/ HDO Air Compressor Air Cleaner (See note 2) (C)
1 GAA Carburetor Throttle Shaft (See note 27) (LV-KK) (C)
1 OE/ HDO Air Cleaner (Gasoline) (Check level) (See note 2) (LV-LL) (C)
Air Cleaner (Diesel and Multifuel) (See page 5 of L.O. and note 34) (C)
4 OE/ HDO Condenser Drain and Refill (Wet tank capacity 18 qt.) (See note 3) (LV-Q) (C)
1 OE/ HDO Air Governor (See note 27) (C)
1 GAA Clutch Cross-Shaft Refill cups, turn one full turn) (See note 27) (LV-MM) (C)
3 GAA Wheels Universal and Slip Joint (See note 9) (LV-OP 28) (C)
1 GAA Brake Pedal (See note 27) (LV-U) (C)
3 GAA Power Takeoff, Universal Joint (Some models) (See note 9) (LV-OQ) (C)
3 GAA Universal and Slip Joint (See note 9) (LV-Z) (C)
1 OE/ HDO Transfer Shaft Linkage, Pins (See note 27) (LV-NN) (C)
3 GAA Power Takeoff Universal and Slip Joint (Some models) (See note 9) (LV-OP 29) (C)
3 GAA Universal Joint (See note 9) (LV-OQ) (C)
12 GAA Rear Wheel Bearings Every 12,000 miles or annually, remove, clean, dry, and repack (LV-L) (C)
3 GAA Universal Joint (See note 9) (LV-OQ) (C)
1 OE/ HDO Power Train Breather Valves (All axles, transfer, and transmission) Check and oil sparingly if needed. (See note 27) (C) (LV-AA)
3 GAA Planks (LV-SS) (C)
NOTE: A REFERENCE TO THE APPROPRIATE LOCALIZED VIEW (LV) IS PROVIDED AFTER EACH LUBRICATION POINT ENTRY

Fig 4-24. Examples of part A of a lubrication order.

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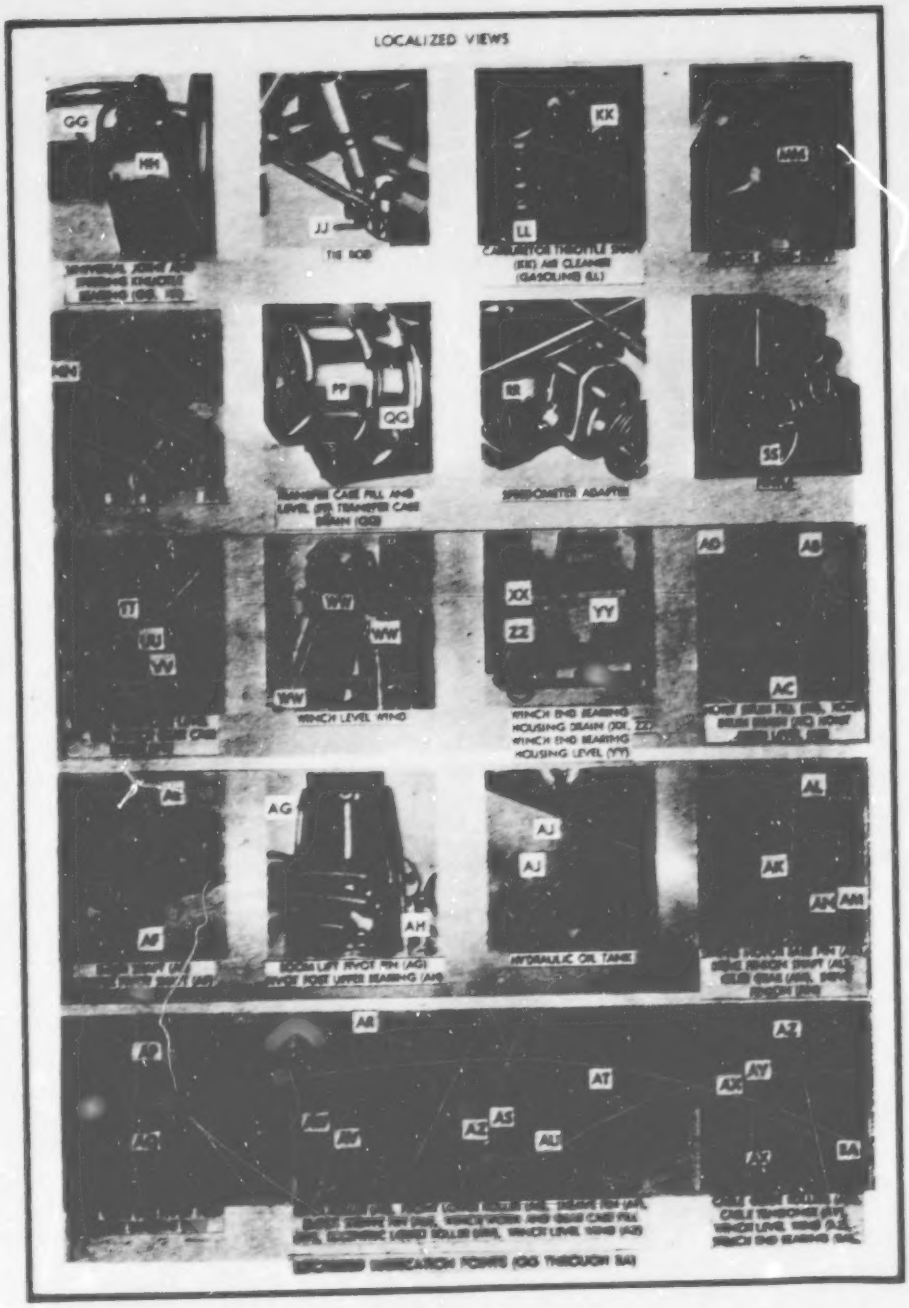

Fig 4-25. Example of Part B of a lubrication order.

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Battery maintenance is a very important part of the weekly preventive maintenance service.

When cleaning batteries, remove battery cables and brush posts with a wire brush to remove any accumulated oxidation. Scrape out battery cable connectors with a suitable tool. Avoid contact of clothing with battery oxide as the resulting chemical reaction will deteriorate clothing. Ensure that your eyes are protected, to prevent entrance of any battery oxide or electrolyte. If any enters the eyes, wash out with large quantities of cool water. Always wash hands thoroughly after handling any lead-acid batteries. See figure 4-26 and 4-27. After cleaning battery cables and posts, reconnect cables to posts. When checking electrolyte level, the battery filler caps have to be removed. If electrolyte is below the full mark. add pure, clean distilled water. Distilled water is preferred to ordinary tap water.

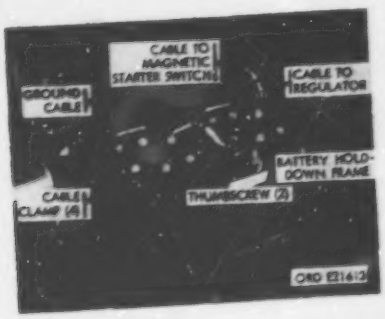


Fig 4-26. Lead acid storage batteries storage compartment.

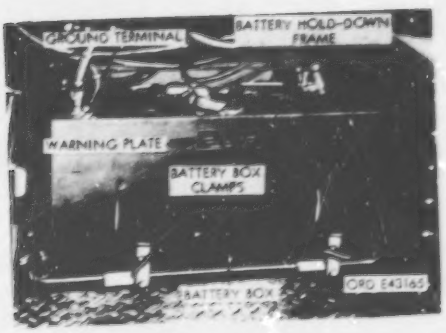


Fig 4-27. Battery cable removal.

There are also many other minor repairs that come under a driver's corrective maintenance service, but they are too numerous to cover in this study unit. Always use the operators manual as a reference. This work unit is designed to give you a general idea of the maintenance authorized for the operators. Your next work unit will cover maintenance under unusual conditions.

EXERCISE: Answer the following questions and check your responses against those listed at the the end of this study unit.

1. List three functions of corrective maintenance that vehicle operators are authorized to perform.

   a. _____

   b. _____

   c. _____

2. Name the type of water that is preferred when replenishing batteries to the correct level. _____

Work Unit 4-4. MAINTENANCE UNDER UNUSUAL CONDITIONS

STATE HOW OFTEN THE ELECTROLYTE LEVEL OF BATTERIES SHOULD BE CHECKED IN A TORRID ZONE.

LIST THE THREE KEY FACTORS TO EFFICIENT ARCTIC-WINTER OPERATIONS.

In a hot weather area of operation, where high temperatures are anticipated, extreme care must be exercised in checking the vehicle's cooling system and battery electrolyte level because of the rapid rate of evaporation. In damp climates, the problem of corrosion of all parts of the vehicle is present and is usually indicated by rust, paint blisters, and fungus growth. The deterioration of the insulation on electrical cables and wires also presents a problem because of the existing danger of short circuits.

The cooling system should be thoroughly cleaned and flushed at frequent intervals and the system kept filled according to the proper specifications listed in the technical manual. Formation of scale and rust in the cooling system occurs more rapidly during operation in extremely high temperatures; therefore, a corrosion inhibitor compound should always be added to the cooling liquid. Avoid the use of water that contains alkali or other substances which may cause scale and rust formations; use soft water whenever possible.

In torrid zones, check the level of electrolyte in cells daily and replenish, if necessary, with pure distilled water. If this is not available, rain or drinking water may be substituted. However, continuous use of water with high mineral content will eventually cause damage to batteries and should be avoided. Batteries operating in torrid zones should have weaker electrolyte, which will prolong the life of the negative plates and separators. A battery will self-discharge at a greater rate if left standing for long periods at high temperatures. If it is necessary to park a vehicle for several days, remove the batteries and store in a cool place.

> Note: Never store acid type storage batteries near stacks of tires as the acid fumes have a harmful effect on rubber.

During hot damp weather, the chassis and body will corrode very rapidly and corrosion will accelerate even more during the rainy season. Corrosion evidence will appear in the form of rust, mildew, mold, or fungus on wood, fabrics, leather, and glass. Protect all exposed exterior painted surfaces with touch-up paint, and a film of engine oil on all bare metal surfaces.

In extreme cold weather, the time required to warm a vehicle, so that it is operable at temperatures as low as -50°F, may approach two hours. Vehicles in poor mechanical condition probably will not start at all, or only after many hours of laborious maintenance and heating. Complete winterization, diligent maintenance, and well-trained operators are the key to efficient arctic winter operations.

The importance of maintenance must be impressed on all concerned. Maintenance of mechanical equipment in extreme cold is exceptionally difficult in the field. Shop maintenance cannot be completed with normal speed, because the equipment must be allowed to thaw out and warm up before the mechanic can make satisfactory repairs. In the field, maintenance must be undertaken under the most difficult conditions. Bare hands stick to cold metal. Fuel in contact with the hands results in supercooling due to evaporation, and your hands can be painfully frozen in a matter of minutes. Engine oils, except sub-zero grade, are unpourable at temperatures below -40°F. Ordinary greases become as solid as cold butter.

Now that you have covered some of the problems that occur during unusual conditions, you will move on to cover another unusual condition - fording.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. State how often the electrolyte level of batteries should be checked in a torrid zone. _____

2. List the three key factors to efficient arctic weather operations.

   a. _____

   b. _____

   c. _____

Work Unit 4-5. MAINTENANCE OF MATERIAL AFTER FORDING

STATE THE MAINTENANCE REQUIRED IF THERE SHOULD BE EVIDENCE THAT WATER HAS ENTERED THE TRANSFER CASE.

STATE THE PM REQUIREMENTS FOR THE BODY AFTER FORDING.

A deep water fording kit may be installed on all M-Series Heavy Tactical Vehicles to be used for river crossing or over the beach operations. Vehicle fording capability may be increased (for example 5-ton M809 series) from 30 inches to 78 inches after the deep water fording kit has been installed. During fording operations, the engine and engine flywheel are pressurized to prevent the entrance of water. The master cylinder, air compressor transmission, hydraulic pump reservoir, and fuel tank(s) are vented to the intake manifold or air cleaner, depending on model vehicle. The alternator is neither waterproofed nor vented. It will cease to charge whenever it is operated under water. It will begin to charge upon leaving the water.

The following maintenance will be coordinated with organizational maintenance personnel. Although the vehicle unit housings are sealed to prevent the free flow of water into the housings, it must be realized that, due to the necessary design of these assemblies, some water may enter, especially during submersion. The following services should be accomplished on all the vehicles which have been exposed to some depth of water or completely submerged, especially in salt water.

The body and chassis should be drained and cleaned out. Clean all exposed surfaces and touch-up paint where necessary. Coat unpainted metal parts with preservative lubricating oil. Lubricate the chassis thoroughly as directed in the lubrication order. Do more than the usual lubrication job, making sure the lubricant has forced out any water present. Check the lubricant in the engine and all power train units. If there is evidence that water has entered, then drain, flush, and refill with correct lubricant. All wheels should be removed. Wheel bearings need to be cleaned, and repacked with grease, assembled and adjusted. While the wheels are removed, dry out brake linings and clean rust and scum from brake drum faces. Check the brake system for pressure of water. Check batteries for quantity and the specific gravity of electrolyte to be sure no water entered through the vent caps. This is especially important if the vehicle was submerged in salt water. Check all electrical connections for corrosion. Drain fuel tanks of any accumulated water; clean fuel filters and lines. If water is found in the air filter, clean and replace the dry-type element. Although most units are sealed, the sudden cooling of the warm interior air upon submersion may cause condensation of moisture within the cases or instruments. A period of exposure to warm air after fording should eliminate this condition.

Good preventive maintenance after a vehicle has been forded is extremely important.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. What maintenance is required if there is evidence that water has entered the transfer case? _____

2. State the PM requirement for the body after fording. _____

   _____

Work Unit 4-6. MAINTENANCE AFTER OPERATION ON UNUSUAL TERRAIN

LIST THE THREE MAINTENANCE FUNCTIONS THAT SHOULD BE PERFORMED DAILY UNDER SAND OR DUST CONDITIONS.

After operation of a vehicle through deep mud, a thorough cleaning and lubrication of all parts affected must be accomplished as soon as possible. The radiator fins and interior of the engine compartment also needs to be cleaned. The repacking of wheel bearings is sometimes necessary.

Other unusual terrain conditions are sand and dust. The engine and engine compartment must be kept clean. Touch up all painted surfaces damaged by sand blasting. Lubricate the vehicle completely to force out lubricants contaminated by sand or dust. Air cleaners, fuel filters, and oil filters must be cleaned daily.

In this last work unit you have covered unusual terrain conditions that can affect the vehicle. In the next study unit, you will cover the preventive maintenance and corrective maintenance of trailers.

EXERCISE: Answer the following question and check your response against that listed at the end of this study unit.

1. List the three maintenance functions that should be preformed daily under sand or dust conditions.

   a. _____

   b. _____

   c. _____

SUMMARY REVIEW

In this study unit, you learned the purpose of preventive maintenance, the officials that are personally responsible for assigned materials, the forms used in recording the PMs, and how to use the forms. Corrective maintenance was defined as well as maintenance under all kinds of conditions. In the next study unit, you will be introduced to M-Series trailers and the maintenance of trailers.

Answers to Study Unit #4 Exercises

Work Unit 4-1.

1. To prevent breakdowns
2. a. Operator
   b. Crew chief

Work Unit 4-2.

1. NAVMC 10627 SD
2. Weekly Preventive Maintenance Form
3. a. Before operation service
   b. During operation service
   c. After operation service
4. c.
   b.
   a.

Work Unit 4-3.

1. a. Minor adjustments
   b. Minor maintenance
   c. Minor removal and installation procedures
2. Distilled

Work Unit 4-4.

1. Daily
2. a. Complete winterization
   b. Diligent maintenance
   c. Well trained operator and crew

Work Unit 4-5.

1. Drain, flush, and refill with correct lubricant
2. Clean surface, lube, and touch-up paint

Work Unit 4-6.

1. a. Lubricate completely
   b. Clean air cleaner
   c. Clean oil filter

STUDY UNIT 5

M-SERIES TACTICAL TRAILERS

STUDY UNIT OBJECTIVE: UPON SUCCESSFUL COMPLETION OF THIS STUDY UNIT, YOU WILL IDENTIFY ALL M-SERIES TRAILERS, THE DIFFERENCES BETWEEN MODELS, OPERATING TECHNIQUES AND THE PREVENTIVE MAINTENANCE PROCEDURES FOR THESE TRAILERS.

Now we are going to discuss trailers and their functions in today's Marine Corps. A trailer is considered a non-prime mover because it is not self-propelled by an engine. It is designed to be pulled by an automobile, truck, or tractor and is used for hauling freight, water, fuel or equipment.

Work Unit 5-1. M105 TRAILER DEFINED

NAME THE TYPE OF HANDBRAKE USED ON THE M105 TACTICAL TRAILER.

STATE THE LOAD CAPACITY OF THE M105 TRAILER.

The M105 (fig 5-1) 1 1/2-ton 2-wheel trailers are designed to be towed by a vehicle equipped with a standard pintle, an air supply, and a 24-volt electrical system. The M105 cargo trailer can be towed by the 2 1/2- or 5-ton tactical truck as a prime mover. The primary purpose of the trailer is for hauling cargo. A break-in of at least 25 miles on all new and reconditioned material is sufficient to completely check their operation. The trailer lights are operated by the towing vehicle through the intervehicular cable. To connect the electrical system of the trailer to the electrical system of the towing vehicle, install the plug assembly on the front of the intervehicular cable into the towing vehicle socket.

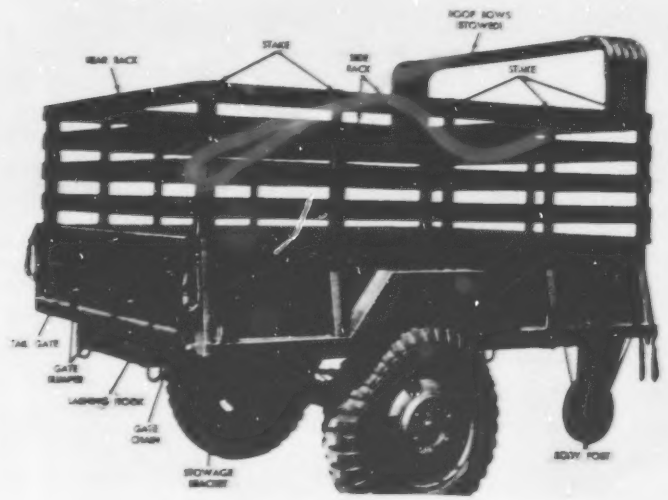


Fig 5-1. Cargo trailer M105A2.

The M105 trailer incorporates two brake systems. The two handbrake levers are located beneath the trailer frame near each wheel. They are used to actuate the mechanical linkage to the brake assemblies, thus expanding the brake shoes to come in contact with the brake drum. This will prevent the trailer from rolling or moving. The service brakes are actuated from within the towing vehicle. An air hose connects the trailer air/hydraulic system to the air system of the towing vehicle. To connect the hose to the towing vehicle, remove the dummy cover and position the half-coupling of the hose face-to-face with the half-coupling of the towing vehicle and lock by turning 90 degrees. A support leg is located at the front of the trailer frame and can be locked in either the vertical or horizontal position by a spring-loaded handle.

Daily preventive maintenance will be performed each day that the vehicle is operated or weekly preventive maintenance will be performed by the operator using a locally produced checklist. When required, always lube the vehicle using the current lubrication order.

You were just acquainted with the M105A2 trailer. The next vehicle you will be introduced to will be the M149A1 water trailer.

EXERCISE: Answer the follwing questions and check your responses against those listed at the end of this study unit.

1. Name the type of handbrake used on the M105A2 tactical trailer.

   _____.

2. The load capacity of the M105A2 trailer is _____.

Work Unit 5-2. M149A1 WATER TRAILER DEFINED

STATE THE GALLON CAPACITY OF THE M149A1 WATER TRAILER.

The M149A1 (fig 5-2) is a 2-wheel water trailer that has a plastic tank with a maximum capacity of 400 gallons. It is towed by 2 1/2-ton and 5-ton vehicles. This trailer is equipped with a standard pintle, air supply and a 24-volt electrical system. The lights are connected to the prime mover with a cable. It also incorporates two types of brake systems. A mechanical handbrake system that is actuated by two levers, and a service brake system that is actuated by the towing vehicle. A difference between the M105A2 and M149A1 is the retractable support leg. On the M149A1, the support leg can be cranked up or down when connecting or disconnecting the vehicle.

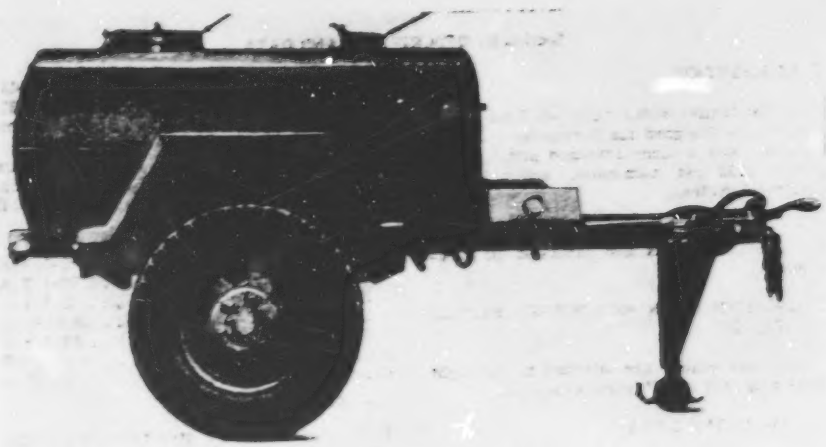


Fig 5-2. M149A1 water trailer.

The water tank control consists of a value that releases water from the tank into the piping. It is closed to permit the pipe to be drained. The faucet levers are depressed to release water from the piping. They are located inside the faucet bores on the piping ends. This vehicle should be cleaned and lubricated thoroughly. Exercise care when removing accumulations of ice, snow, mud, and sand to prevent damage to the affected parts. When cleaning the tank interior, always consult preventive maintenance for instructions and inspection procedures.

You have just been introduced to the M149A1 water trailer and how to operate it. In the next work unit, you will read about the M127A1 semi-trailer.

EXERCISE: Answer the following question and check your response against that listed at the end of this study unit.

1. The gallon capacity of the M149A1 water trailer is _____.

Work Unit 5-3. M127A1 SEMI-TRAILER DEFINED

NAME THE M-SERIES TRUCK THAT THE M127A1 IS DESIGNED TO BE TOWED WITHOUT USING A DOLLY CONVERTER.

The M127A1 (fig 5-3) semi-trailer is used to haul cargo, small vehicles and trailers. The prime mover is a M52A2 tractor. Other tractors equipped with proper fifth wheels can also pull these trailers. The maximum pay load is 12 tons cross-country and 18 tons on hard surface roads. The 12-ton, 4-wheel, stake, semi-trailer M127A1 consists essentially of a body frame of welded construction mounted on a chassis. The frame consisting of pressed steel side rails, and crossmembers are welded together with the chassis frame forming one integral unit. A tool box is provided beneath the body frame on the left side. The panels which enclose the body are made up of 13 removable sections; one on the front, two on the rear, and five on each side. A hardwood floor is fastened directly to the body frame.

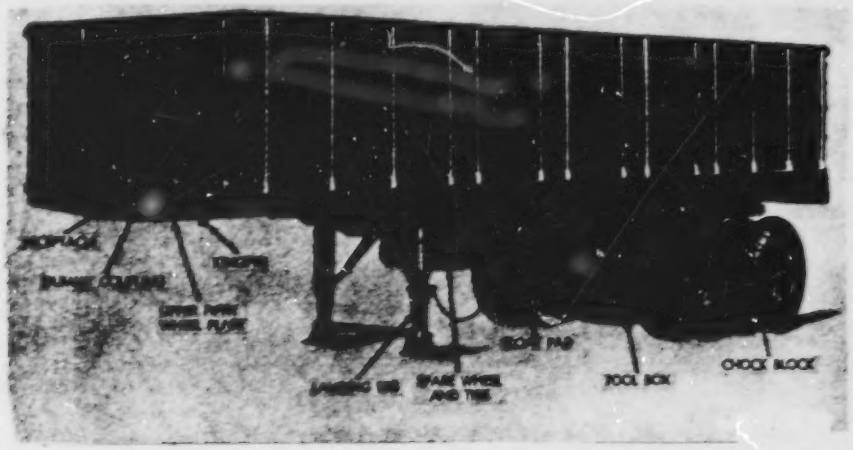


Fig 5-3. M127A1 semi-trailer.

The M127A1 is equipped with an upper fifth-wheel plate welded to the front of the chassis. Twenty-four-volt tail lights and clearance lights are supplied with current and operated from the towing vehicle. There are also, foot-type landing legs (retractable supports) that support the front end of the vehicle, when not coupled to a towing vehicle. A spare tire is carried on a winch-type spare tire carrier mounted under the right side. Chock blocks are provided to keep the vehicle from rolling when parked. Also, two float pads are provided to keep the landing legs from sinking in soft ground when the trailer is uncoupled from the towing vehicle. The trailer is equipped with air over hydraulic brakes that supplied air pressure actuates. The air is controlled by the towing vehicle. Two air hoses are connected to the trailer and prime mover so air can be supplied to the trailer. The trailer will also have a daily preventive maintenance inspection so that defects may be discovered and corrected.

You now have been introduced to the M127A1 semi-trailer.

EXERCISE: Answer the following question and check your response against that listed at the end of this study unit.

1. The M-Series truck that the M127A1 is designed to be towed without using a dolly converter is the _____.

Work Unit 5-4. M172A1 LOW-BED TRAILER DEFINED

NAME THE M-SERIES TRUCK THAT IS COMPATIBLE FOR TOWING THE M172A1.

The M172A1 (fig 5-4) is a 4-wheel, low bed, semi-trailer. It is used for hauling all types of cargo and equipment. The prime mover is a 10-ton tractor M123E1 and the maximum capacity for the M172A1 is 25 tons.

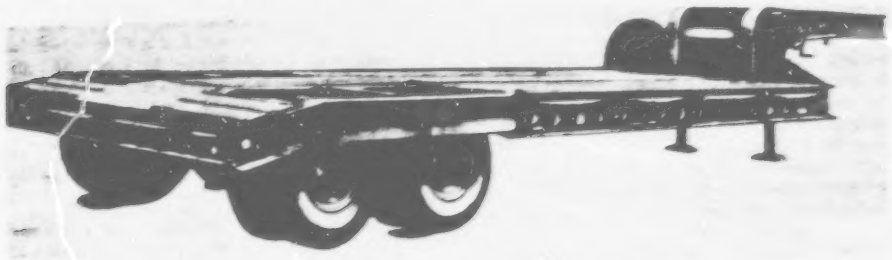


Fig 5-4. M172A1 low bed semi-trailer.

The semi-trailer M172A1 is a tandem axle, dual-tired vehicle designed to be towed by a tractor truck vehicle equipped with a fifth wheel and suitable air brake and lighting connection. The semi-trailer is constructed of a welded, heavy duty frame covered with 2 1/4-inch planking. A gooseneck structure at the front end of the semi-trailer supports the load bed and contains a double end kingpin which fits to the fifth wheel of the towing vehicle. Two manually actuated, retractable shoe type landing gear legs provide a support for the front end of the trailer when it is uncoupled. The landing gear is controlled by a hand-operated, ratchet-type handcrank located on the two-speed gearbox. The gearbox has a low gear and high gear. Pushing the handcrank inward one inch engages high gear, and outward one inch engages the low gear. A pawl on the ratchet handle case is set to give ratchet action for either raising or lowering the landing gear legs. The M172A1 semi-trailer is equipped with a straight air brake system. When using the semi-trailer, ensure that the brakes operate efficiently due to the weight and momentum of the cargo. Apply the semi-trailer brake to prevent the load from pushing the towing vehicle. Air supply on the towing vehicle dash gage should not be less than 80 PSI for proper brake application. The distribution of the weight has its effect on stopping. A daily preventive maintenance inspection will be held each day that it is operated.

Your next and final work unit will be about the Dolly Converter.

EXERCISE: Answer the following question and check your response against that listed at the end of this study unit.

1. The M-Series truck that is compatible for towing the M172A1 is the _____.

Work Unit 5-5. M-SERIES DOLLY CONVERTERS DEFINED

STATE ONE PURPOSE OF A DOLLY CONVERTER.

STATE THE MAXIMUM LOAD CAPACITY OF THE M198A1 M-SERIES DOLLY CONVERTER.

The Marine Corps uses three models of the dolly converter: the M197A1, M198A1 and M199.

The 6-ton 2-wheel M197A1 and the 8-ton, 2-wheel M198A1 trailer converter dollies (figs 5-5 and 5-6) are for use in converting semi-trailers to full trailers. This conversion is to allow the trailer to be towed by vehicles other than conventional tractors equipped with a fifth wheel. The dollies are provided with a fifth wheel for attachment to a semi-trailer, and a lunette for attachment to the towing vehicle. The dolly does not have an electrical system. Intervehicular air hose and electrical cables on the dolly provide for interconnection between the towing vehicle and the semi-trailer. Four reflectors are mounted on the dolly frame, two at the rear and one at each side. All dollies are equipped with welded tubular type axles. Spring seats and flanges are welded to the axle tube. The service brakes, air over hydraulic, receive air supply from the towing vehicle with an interconnecting hose to supply the semi-trailer. Air chambers are mounted remotely from wheels that operate the brakes through hydraulic linkage. The dolly frames are basically of the same structural design. The M198A1 have stronger frames than the M197A1 due to stronger centers, reinforced with a cross rail. On the M198A1 model, the lunette has two alternate positions six inches apart. The M197A1 has a fixed lunette with no adjustment. The M197A1 and M198A1 are both designed to be towed with a 2 1/2-ton cargo truck or larger vehicle.

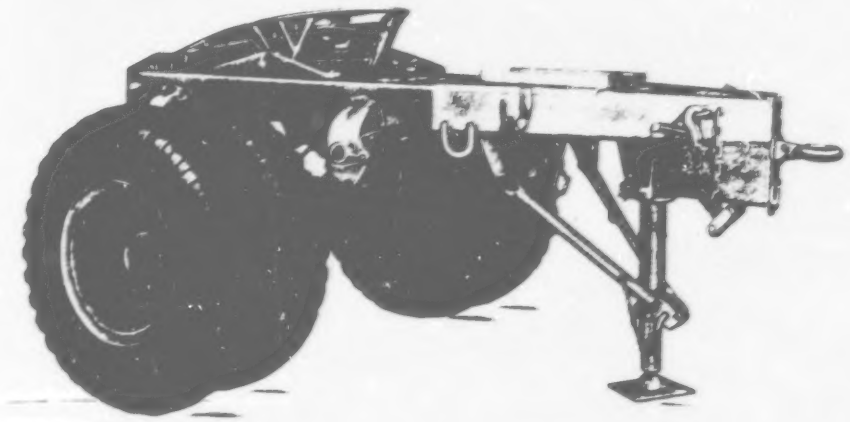


Fig 5-6. M198A1 Dolly Converter.

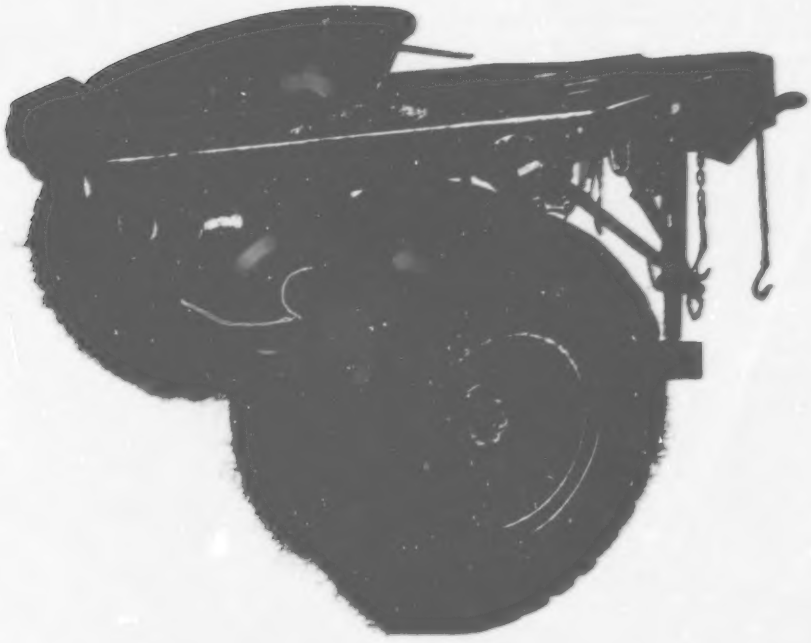


Fig 5-6. M197A1 Dolly converter.

The M199 (fig 5-7) is a four-wheel 18-ton tandem dolly converter. It is also used to convert semi-trailers into full trailers, which can be towed by a vehicle equipped with a towing pintle. The prime vehicle mover will be a 5-ton vehicle or larger. The frame is constructed of pressed steel and the lunette and draw bar are attached by hinge pins so the lunette and draw bar have a hinging effect for flexibility. The service brake is a straight air system that is controlled by the operator of the towing vehicle. The M199 dolly converter is equipped with lights. It can be towed bobtailed.

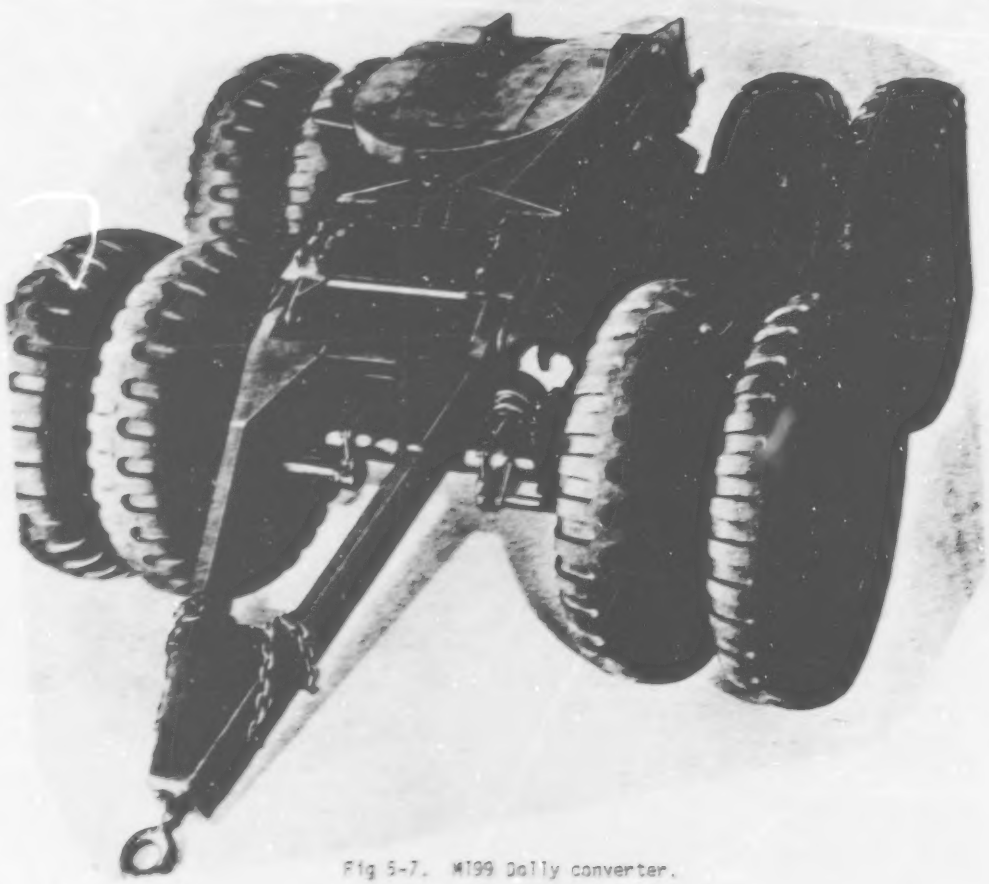


Fig 5-7. M199 Dolly converter.

You have just covered the dolly converters found in the motor transport field and the FMF. Daily maintenance services will be performed on all vehicles and equipment operated daily to ensure readiness.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. One purpose of a dolly converter is _____.

2. The maximum load capacity of the M198A1 M-series Dolly converter is _____.

SUMMARY REVIEW

In this study unit, you have been introduced to most of the tactical M-Series trailers found in today's Marine Corps. You have learned their purposes, construction, differences between models, operating techniques and finally most of the preventive maintenance procedures that are to be performed by the operator.

Answer to Study Unit #5 Exercises

Work Unit 5-1.

1. mechanical
2. 1 1/2 tons

Work Unit 5-2.

1. 400 gallons

Work Unit 5-3.

1. M52A2 semi-tractor

Work Unit 5-4.

1. M123E1

Work Unit 5-5.

1. to convert semi-trailers to full trailers
2. 8 tons

PREVENTIVE MAINTENANCE AND OPERATING TECHNIQUES FOR HEAVY VEHICLES

Review Lesson

Instructions: This review lesson is designed to aid you in preparing for your final exam. You should try to complete this lesson without the aid of reference materials, but if you do not know an answer, look it up and remember what it is. The enclosed answer sheet must be filled out according to the instructions on its reverse side and mailed to MCI using the envelope provided. The questions you miss will be listed with references on a feedback sheet (MCI-R69) which will be mailed to your commanding officer with your final exam. You should study the reference material for the questions you missed before taking the final exam.

A. Multiple Choice: Select the ONE answer that BEST completes the statement or answers the question. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

1. The 2 1/2-ton 6x6 M-Series trucks are designed as

   a. commercial vehicles.
   b. tactical vehicles.
   c. cargo vehicles only.
   d. highway-use vehicles only.

2. What is one of the general characteristics of the 2 1/2-ton M-Series truck?

   a. All-wheel drive capabilities
   b. Swimming capabilities
   c. Provides 12 forward speed ranges
   d. Designed for cross-country terrain only

3. How many speed selection ranges does the 2 1/2-ton M-Series truck provide the operator?

   a. 5 forward speeds, one reverse
   b. 8 forward speeds, one reverse
   c. 10 forward speeds, two reverse
   d. 12 forward speeds, two reverse

4. The 2 1/2-ton M-Series truck will ford hard-bottom water crossings without the aid of fording equipment to a depth of

   a. 20 inches.
   b. 30 inches.
   c. 40 inches.
   d. 50 inches.

5. What tool should be used with the rear lifting shackles to prevent body damage?

   a. A crow bar
   b. A pintle hook
   c. A hydraulic actuator
   d. A spreader bar

B. MATCHING: Match the types of equipment in column 1 (items 6-9) with the proper models in column 2. For each item, select one letter (a, b, c, or d) indicating your choice and mark it on your answer sheet by blackening the appropriate circle.

Value: 1 point each

	Column 1 Types	Column 2 Proper Models
_____	6. Cargo body	a. M49A2C
_____	7. Fuel Tanker	b. M50A2
_____	8. Van body	c. M35A2C
_____	9. Water tanker	d. M109A2

C. Multiple Choice: Select the ONE answer that BEST completes the statement or answers the question. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

10. How many types of fuel is the 2 1/2-ton fuel tanker designed to carry?

    a. 1 type
    b. 2 types
    c. 3 types
    d. 4 types

11. What system in the 2 1/2-ton water tanker heats the water to prevent freezing during cold weather?

    a. Space heat system
    b. Cooling system
    c. Exhaust system
    d. Transmission oil heater

12. The 2 1/2-ton M-Series truck contains which of the following model engines?

    a. 4 cylinder liquid-cooled diesel
    b. Cummins 250 (NHL)
    c. 6 cylinder multifuel LD-465-1C
    d. 6 cylinder multifuel LDS-465

13. What component in the cooling system draws water from the bottom of the radiator?

    a. Thermostat
    b. Fan belts
    c. Hoses
    d. Water pump

14. How is air drawn through the radiator core of the cooling system?

    a. By the blower assembly
    b. By the turbo air charger and intake
    c. By fan and truck motion
    d. By truck motion and the blower assembly

D. MATCHING: Column 1 (items 15-19) lists various components of a fuel system. Column 2 (A-E) contains illustrations of these various components. Match each fuel system component in column 1 with its illustration in column 2. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

Column 1
Components

____ 15. Fuel filter

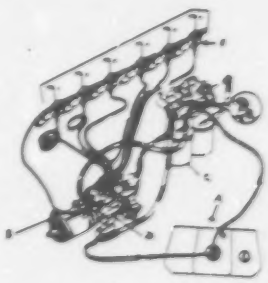
____ 16. Fuel tank

____ 17. Supply pump

____ 18. Injection pump

____ 19. Injector nozzle

Column 2
Illustration



E. Multiple Choice: Select the one answer that best completes the statement or answers the question after the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

20. The 2 1/2-ton M-Series fuel tanker is equipped with what type of muffler?

a. Turbo type
b. P.V. muffler
c. Spark arrestor type
d. Straight-thru construction type

21. What is the type of transmission used on all 2 1/2-ton M-Series vehicles?

a. Automatic
b. Constant-mesh
c. Selective-gear type
d. Synchromesh

22. Where is the transfer located in all 2 1/2-ton M-Series trucks?

a. Behind the transmission
b. Behind the rear differential assembly
c. In front of the engine
d. In front of the transmission

23. What component in the powertrain system of the 2 1/2-ton M-Series vehicle provides two driving ratios for each transmission speed?

a. PTO unit
b. Transfer assembly
c. Trans-axle
d. Differential and final drives

24. The 2 1/2-ton M-Series truck suspension system uses what type of front springs?

a. Coil
b. Volute
c. Semi-elliptical leaf
d. Shock regulating coil

25. What type of service brake system is used by all 2 1/2-ton M-Series vehicles?

a. Hydraulic
b. Air
c. Mechanical
d. Air-operated hydraulic

26. What two important controls and linkages are necessary for the operation of the 2 1/2-ton M-Series vehicle?

a. Clutch pedal and safety strap
b. Brake pedal and cargo paulin
c. Service brake pedal and accelerator pedal
d. Passenger seat handle and stop cable

27. How many batteries are used in the electrical system of the 2 1/2-ton M-Series truck?

a. 1
b. 2
c. 4
d. 6

28. What is the primary purpose of the breather and ventilation system?

a. To provide air for tire inflation
b. To prevent a vacuum
c. To prevent rotting of canvas
d. To ventilate cab conditions

29. What is the correct foot length of the M35A2C cargo bed?

a. 8 feet
b. 10 feet
c. 12 feet
d. 15 feet

30. What is the correct number of fuel compartment(s) in the 2 1/2-ton M-Series fuel tanker?

a. 1
b. 2
c. 3
d. 4

31. What is the maximum gallon capacity of the 2 1/2-ton M-Series water tanker?

a. 500 gallons
b. 1,000 gallons
c. 1,500 gallons
d. 5,000 gallons

32. What is the correct fording depth of the 5-ton M-Series truck with a fording kit?

a. 58 inches
b. 68 inches
c. 78 inches
d. 88 inches

33. What is the purpose of the pintle hook?

a. To tie down aboard ship
b. To lift vehicles
c. To pull with a tow chain
d. To tow trailers

34. How is air inducted into the multifuel engine of the 5-ton M-Series?

a. By a turbo charger
b. By injection
c. By natural aspiration
d. By air pump

35. How is front wheel drive engaged on the multifuel series 5-ton?

a. Automatically
b. With a selector switch
c. By the operator with a lever
d. When the front wheel looses traction

36. How many fuel tanks are used by M-Series M52A2 truck tractor?

a. 1
b. 2
c. 3
d. 4

37. How does the M39 Series transmission operate?

a. Automatically
b. Manually
c. At selector speeds
d. Range ignition

F. Matching: Column 1 (items 38-41) contains a list of the different types of M-39 series chassis models. Match the type of chassis in column 1 with its corresponding chassis model number in column 2. For each item, select one letter (a, b, c, or d) indicating your choice. After the corresponding number on your answer sheet, blacken the appropriate circle.

Value: 1 point each

	Column 1	Column 2
	M-39 Chassis	Chassis model number
_____	38. Cargo body	a. M51A2
_____	39. Dump truck	b. M52A2
_____	40. Wrecker	c. M54A2C
_____	41. Tractor truck	d. M543A2

G. Multiple Choice: Select the ONE answer that BEST completes the statement or answers the question. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

42. What is the rated horsepower of the Cummins engine in the M809 Series vehicles?

a. 200 HP
b. 250 HP
c. 300 HP
d. 350 HP

43. How is air inducted into the Cummins cylinder ignition-compression engine?

a. By the turbo charger
b. By the super charger
c. It is naturally aspirated.
d. By the blower

44. What is the purpose of the intake manifold preheater?

a. It is used to heat manifold metal.
b. It is used in hot weather to aid in starting.
c. It is used to heat water in the manifold.
d. It is used to preheat inducted air during cold weather.

45. The M809 Series tactical trucks has _____ storage batteries.

a. 1
b. 2
c. 3
d. 4

46. What type of transmission is used in all M-939 Series vehicles?

a. 3-speed automatic
b. 5-speed manual
c. 4-speed manual
d. 5-speed automatic

47. What type of service brakes are used in the M939 Series vehicles?

a. Mechanical brakes
b. Hydraulic brakes
c. Air brakes
d. Air assisted hydraulic brakes

H. Matching: Column 1 (items 48-51) contains a list of the M-939 Series chassis. Column 2 (a through d) contains a list of model numbers. Match each type of chassis in column 1 with its model number in column 2. For each item, select one letter (a, b, c, or d) indicating your choice. After the corresponding number on your answer sheet, blacken the appropriate circle.

Value: 1 point each

Column 1 M-939 Chassis		Column 2 Model number
_____	48. Cargo body	a. M923
_____	49. Dump truck	b. M929
_____	50. Tractor truck	c. M931
_____	51. Wrecker truck	d. M936

I. Multiple Choice: Select the ONE answer that BEST completes the statement or answers the question. After the corresponding number on the answer sheet blacken the appropriate circle.

Value: 1 point each

52. What type of engines is used in the M39 Series retrofit truck?

a. 4 cylinder multifuel
b. 6 cylinder multifuel
c. 4 cylinder cummins
d. 6 cylinder cummins

53. What M-Series 5-ton truck is being retrofitted?

a. M39 Series
b. M809 Series
c. M939 Series
d. M813 Series

54. What is one primary purpose of the 10-ton M-Series tractor?

a. It is primarily used in combat recovery operations.
b. It is primarily used to haul troops.
c. It is primarily used to haul water.
d. It is primarily used to haul wreckers.

55. What model 10-ton M-Series vehicle does the Marine Corps use?

a. M123E1
b. M-923E1
c. M-125E1
d. M-151A2C

56. What type of engine is found in the 10-ton M-Series vehicle?

a. Multifuel engine
b. Cummins 250 engine
c. Cummins 300 engine
d. Detroit diesel engine

57. What type of service brake system is used on the 10-ton M-Series vehicle?

a. Mechanical
b. Hydraulic
c. Air
d. Air-assisted Hydraulic

58. What component part actuates the hydraulic power assisted steering unit?

a. Governor assembly
b. Hydraulic steer pump
c. Front wheels
d. Steering wheel

59. What component part in the brake system of the 10-ton M-Series vehicle compensates for lining wear?

a. Brake pedal free travel
b. Brake shoes
c. Bendix adjusters
d. Slack adjusters

60. What is the minimum distance of the road test used when breaking in a new vehicle?

a. 25 miles
b. 50 miles
c. 75 miles
d. 100 miles

61. How often should the engine oil be checked during break-in operations?

a. Every 50 miles or 5 hours
b. Every 100 miles or 10 hours
c. Every 300 miles or 10 hours
d. Every 500 miles or 50 hours

62. What should an operator avoid during break-in operation?

a. Using the vehicle on unusual terrain
b. The use of low and high transfer
c. Short periods of operation
d. Rapid acceleration and deceleration

63. What is the purpose of the hand control throttle?

a. To set engine speed at any desired rpm
b. To start the vehicle
c. To control fuel consumption
d. To control turbo charger rpm

64. What is the purpose of the battery switch?

a. It energizes the batteries.
b. It energizes all electrical circuits.
c. It indicates the state of the battery charge.
d. It energizes instrument gages only.

65. On the M809 Series vehicles what control is used after changing fuel filter elements to bleed air from the fuel system?

a. Bleeder ball
b. Bleeder value control
c. Fuel filter spanner wrench
d. Preheater primer pump

66. What is the purpose of the air cleaner filter indicator?

a. It indicates the location of the air filter.
b. It indicates air pressure in PSI's.
c. It indicates atmosphere pressures.
d. It indicates the condition of air filter elements.

67. What does the tachometer indicate?

a. Operating speed of the fifth wheel
b. Operating speed of the vehicle in rpm's
c. Operating speed of the engine in rpm's
d. Operating Pressure in PSI's

68. What is the purpose of the manifold heater on multifuel equipped vehicles?

a. To heat expanding gases
b. To increase fuel vaporization
c. To preheat inducted air during coldweather
d. To heat the cab area

69. Who performs preventive maintenance services each day the vehicle is operated?

a. Shop chief
b. Mechanic
c. Dispatcher
d. Operator

70. What is the purpose of preventive maintenance?

a. To keep the mechanics well informed
b. To keep the operators busy
c. To ensure minimum readiness
d. To prevent break-downs

71. Which two officials are personally responsible for assigning vehicles?

a. Motor transport officer and operator
b. Section leader and dispatcher
c. Operator and crew cheif
d. Motor transport officer and section chief

72. What form is used to record daily deficiencies after heavy vehicle use?

a. SF-46
b. NAVMC 10627SD
c. NAVMC 1064D
d. NAVMC 1042F

73. What inspection form would you record before, during, and after operation services?

a. SF-46
b. NAVMC 10647D
c. NAVMC 10637D
d. NAVMC 10627D

J. Matching: Match each operational service in column 1 (items 74-76) with the proper check list item in column 2. For each item, select one letter (a, b, or c) indicating your choice. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

	Column 1 Service	Column 2 Check list item
74.	_____ Before	a. Clean
75.	_____ During	b. Engine warm-up
76.	_____ After	c. Steering

K. Multiple Choice: Select the ONE answer that BEST completes the statement of answers the question. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

77. When performing daily preventive maintenance services, when is the coolant level checked?

a. Before the operation phase only
b. During the operation phase only
c. After the operation phase only
d. Both before and after the operation phases

78. How is the hydraulic power steering oil level checked on the M809 and M939 Series vehicles?

a. Visually by removing filler cap
b. Visually through filler plug
c. Visually with a dipstick
d. Visually through a sight glass

79. When checking the fuel filter/water separator for large amounts of water or impurities, what do you do?

a. You allow one pint of fuel to drain.
b. You allow two pints of fuel to drain.
c. You allow three pints of fuel to drain.
d. You allow the fuel to drain until it is clean.

80. When should you check and adjust, if needed, your tire pressure?

a. When the tire is low
b. When the tire is warm
c. When the tire is cold
d. After operation only

81. On which form do you record weekly preventive maintenance?

a. SF-46
b. NAVMC 1300
c. NAVMC 1500
d. A locally produced form

82. What are two functions of corrective maintenance performed by a vehicle operater?

a. Minor and major adjustments
b. Minor and major maintenance
c. Minor adjustments and minor maintenance
d. Minor adjustments and major maintenance

83. What item is used to protect the winch, cable and operator from overload, damage, and injury?

a. Copper pin
b. Steel pin
c. Cotter pin
d. Shear pin

84. What type of liquid is used to fill lead acid batteries in heavy vehicles?

a. Hot water
b. Distilled water
c. Soda water
d. Mineral water

85. The system in a heavy vehicle in which extreme care is exercised in a torrid zone is the

a. exhaust system.
b. intake system.
c. cooling system.
d. lighting system.

86. How often should the electrolyte level of batteries be checked in a torrid zone?

a. Daily
b. Weekly
c. Monthly
d. Semi-annually

87. Why should batteries have weaker electrolyte in a torrid zone?

a. To prevent harmful effects on rubber components
b. To prevent rust and corrosion of the battery box
c. To prolong the life of the battery
d. To prevent self-discharge in cold weather

88. How much time is required to warm a vehicle to an operable condition in 50 degrees or colder weather?

a. 10 minutes
b. 30 minutes
c. 1 hour
d. 2 hours

89. Two key factors to efficient arctic winter operation are complete winterization and diligent maintenance. What is the third factor?

a. Good snow tires
b. Major removal of snow
c. A well-trained operator and crew
d. The correct use of fuel

90. During fording operations, what will happen to the alternator when it is submerged in water?

a. If it is vented and waterproofed it will continue to charge.
b. If it is vented only, it will continue to charge.
c. If it is waterproofed, it will continue to charge.
d. It will cease to charge.

91. What should you do when water is found mixed with the lubricant in the transfer assembly?

a. Drain and change the lubricant.
b. Install heavier grade lubricant to seal.
c. Install water absorbent solutions.
d. Drain, flush, and install correct the lubricant.

92. What three preventive maintenance procedures does the truck body require after a fording operation?

a. Clean the surface, lube, and touch up the paint.
b. Drain the transfer, transmission and rear end.
c. Clean the surface, lube, and change the engine oil.
d. Clean the surface, lube, and check the batteries.

93. What three daily maintenance functions should be performed in sand and dust conditions?

a. Clean the air cleaner, oil filters, and lubricate.
b. Clean, wipe, and lubricate the truck.
c. Clean the batteries, truck body, and lubricate.
d. Clean the glass, truck body, and lubricate.

94. What type of handbrake is used on the M105 tactical trailer?

a. Air-assisted hydraulic brake
b. Air brake
c. Hydraulic brake
d. Mechanical brake

95. What is the load capacity of the M105 trailer?

a. ¾ ton
b. 1 1/2 tons
c. 2 tons
d. 2 1/2 tons

96. What is the gallon capacity of the M149 water trailer?

a. 200 gallon
b. 300 gallon
c. 400 gallon
d. 600 gallon

97. What M-Series truck is designed to tow the M127A1 semi-trailer without the use of a dolly converter?

a. M52A2C
b. M54A2C
c. M60
d. M939

98. What M-Series truck is used to tow the M172A1?

a. M54A2C
b. M35A2C
c. M49A2
d. M123E1

99. A dolly converter is used to convert

a. dolly wheels to tandem wheels.
b. trailers to semi-trucks.
c. semi-trailers to full trailers.
d. full trailers to semi-trailers.

100. What is the maximum capacity of the M198A1 M-Series dolly converter?

a. 6 tons
b. 8 tons
c. 10 tons
d. 12 tons

Total Points: 100

* * *

T&E-1

STUDENT COURSE CONTENT ASSISTANCE REQUEST

DATE:

COURSE NUMBER _____ COURSE TITLE _____

NAME _____ RANK _____ MOS _____

SOCIAL SECURITY NUMBER _____

COMPLETE MILITARY ADDRESS: _____

1. Use this form for any questions you may have about this course. Write out your question and refer to the study unit, work unit, or study question which you are having problems with. Complete the self-addressed block on the reverse side. Before mailing, fold the form and staple it so that MCI's address is showing. Additional sheets may be attached to this side of the form.

MY QUESTION IS: _____

OUR ANSWER IS: _____

DATA REQUIRED BY THE PRIVACY ACT OF 1974
(5 U.S.C. 522A)

1. AUTHORITY: Title 5, USC, Sec. 301. Use of your Social Security Number is authorized by Executive Order 9397 of 22 Nov 43.

2. PRINCIPAL PURPOSE(S): The Student Course Content Assistance Request is used to transmit information concerning student participation in MCI courses.

3. ROUTINE USE(S): This information is used by MCI personnel to research student inquiries. In some cases information contained therein is used to update correspondence courses and individual student records maintained by the Marine Corps Insitute.

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INSTRUCTIONS TO STUDENT

1. Fold so that MCI address is outside
2. Insert course number in square marked "Course Number" below
3. Seal with scotch tape or one staple
4. Mail to MCI

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MARINE CORPS INSTITUTE
MARINE BARRACKS
P.O. BOX 1775
ARLINGTON, VIRGINIA 22222

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ATTN: MOSTD

Use this space for additional comments.

COURSE IMPROVEMENT SURVEY

The Marine Corps Institute would appreciate your help in improving the course you have just completed. If you would take a few minutes to complete the following survey, we would have valuable information to help us improve this course. Your answers will be kept confidential and will in no way affect your grade.

Course Number [ ] Rank_____ MOS_____

Name (Optional) _____

Military Address (Optional) _____

1. Did you find inaccurate or outdated information in this course? ☐ Yes ☐ No

   List the areas you found inaccurate or out of date. Give page or paragraph if possible.

   _____

   _____

   _____

2. How long did it take you to finish the course?

   ☐ 1-5 hours ☐ 6-10 hours ☐ 11-15 hours ☐ 16-20 hours ☐ More than 20 hours

3. Were the procedures taught in this course understandable and useful? ☐ Yes ☐ No

   If "No," how could they be improved? _____

   _____

4. How much of the material taught in this course can you apply to your job?

   ☐ Almost all ☐ More than half ☐ Very little ☐ Less than half ☐ None

5. Did you have trouble reading or understanding the material in this course? ☐ Yes ☐ No

   If "Yes,", explain_____

6. Were the illustrations in this course helpful? ☐ Yes ☐ No

   If "No," how could they be improved?_____

7. Put an "X" in a box on the scale below to show how well you feel the lessons and the course materials prepared you for the final examination. (On this scale "10" indicates that the material prepared you very well, a "5" indicates adequate preparation, and a "1" indicates very poor preparation.)

Very Poor				Adequate					Very Well
1	2	3	4	5	6	7	8	9	10

8. If you asked MCI for help, were the answers to your questions helpful?

   ☐ Yes ☐ No ☐ No questions sent to MCI

9. Please list below any suggestions you may have to improve this course. Try to be specific; give page or paragraph numbers. (You may also use the space on the back or attach additional sheets.)

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